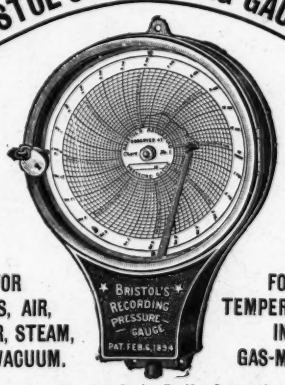
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1988.] LONDON, JUNE 18, 1901. [53RD YEAR. PRICE 6d.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

BRISTOL'S RECORDING GAUGES



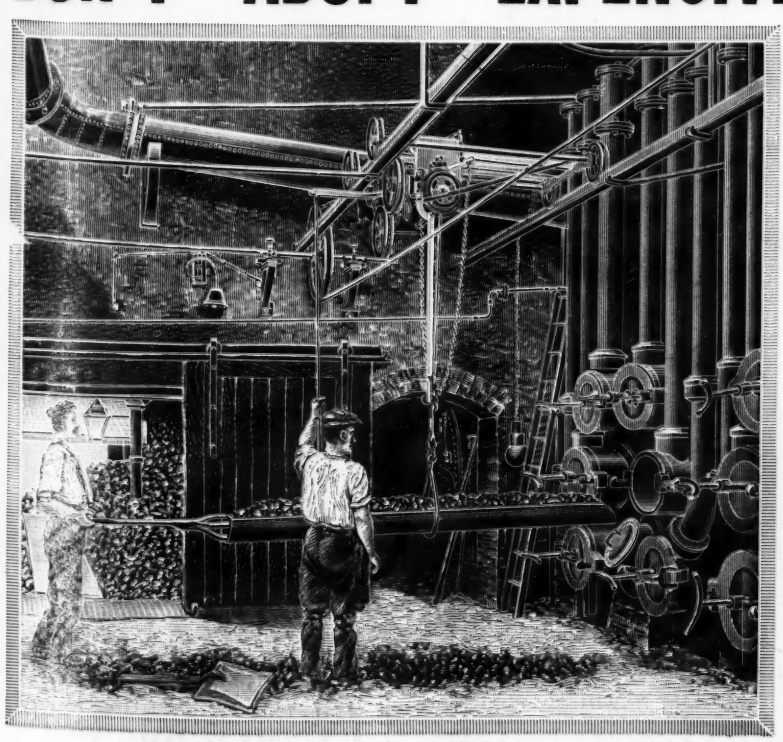
FOR GAS, AIR, WATER, STEAM, OR VACUUM.
FOR TEMPERATURE IN GAS-MAINS.
Many Thousands in Daily Operation.
J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

Wrought-Iron
TUBES
And Fittings and Accessories.
LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

DON'T ADOPT EXPENSIVE MACHINERY

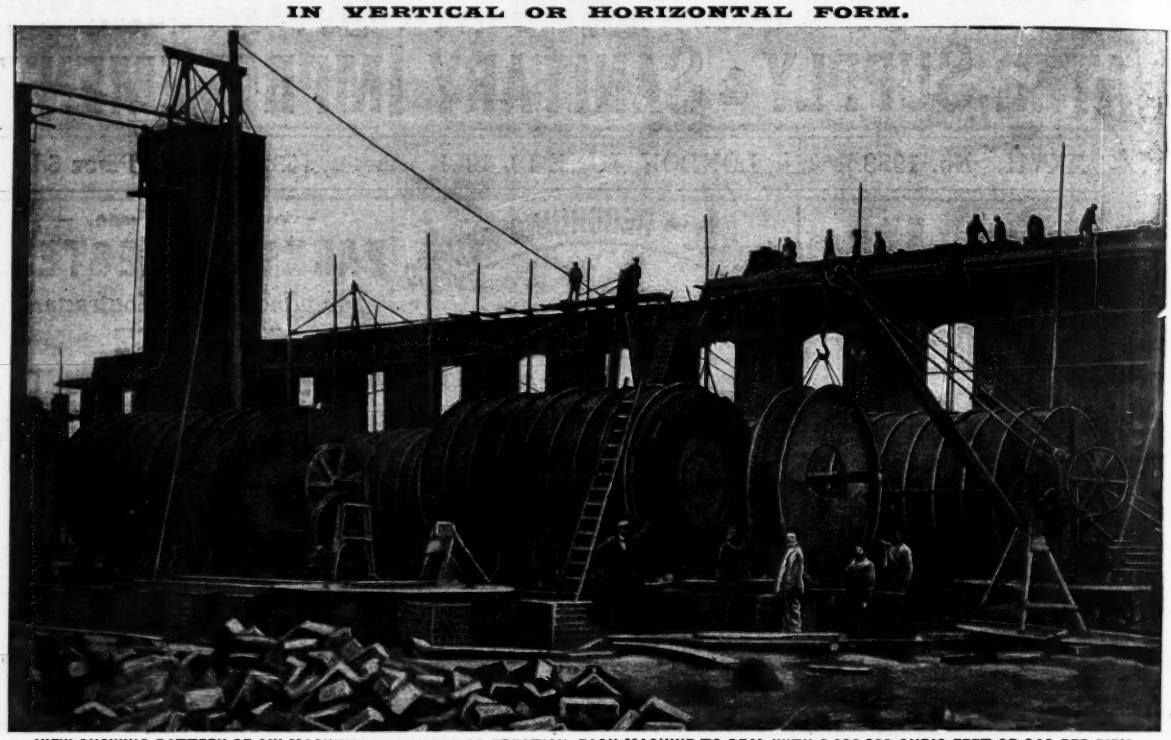


BUT USE THE
PATENT
"RAPID"
POWER CHARGING APPARATUS
FOR LARGE WORKS.

Can be seen at work by appointment.

Biggs, Wall & Co.
13, CROSS STREET, FINSBURY,
LONDON, E.C.
TELEGRAPHIC ADDRESS:
"RAGOUT, LONDON."

W. C. HOLMES & CO.'S
PATENT "NEW" SCRUBBER-WASHER
IN VERTICAL OR HORIZONTAL FORM.



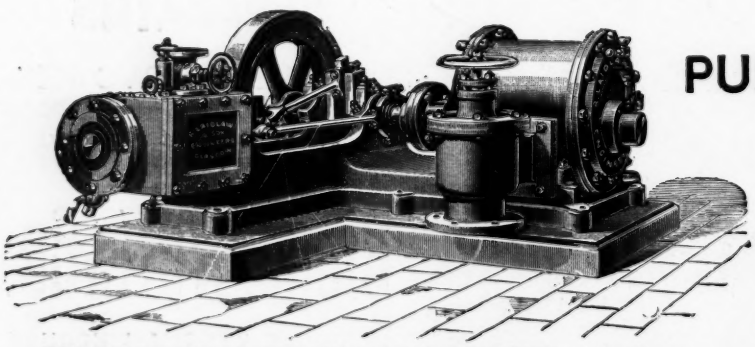
VIEW SHOWING BATTERY OF SIX MACHINES IN COURSE OF ERECTION, EACH MACHINE TO DEAL WITH 3,000,000 CUBIC FEET OF GAS PER DIEM.

W. C. HOLMES & CO., Contractors to His Majesty's Government, TURNBRIDGE, HUDDERSFIELD.

R. LAIDLAW & SON,
ENGINEERS & IRONFOUNDERS,

CAST-IRON PIPES
ALL SIZES.

MANUFACTURERS OF
STEAM-ENGINES,
EXHAUSTERS,
VALVES,
AND
PUMPING-ENGINES.



BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. ALL SIZES.

ALL KINDS OF
GAS AND WATER
APPARATUS.

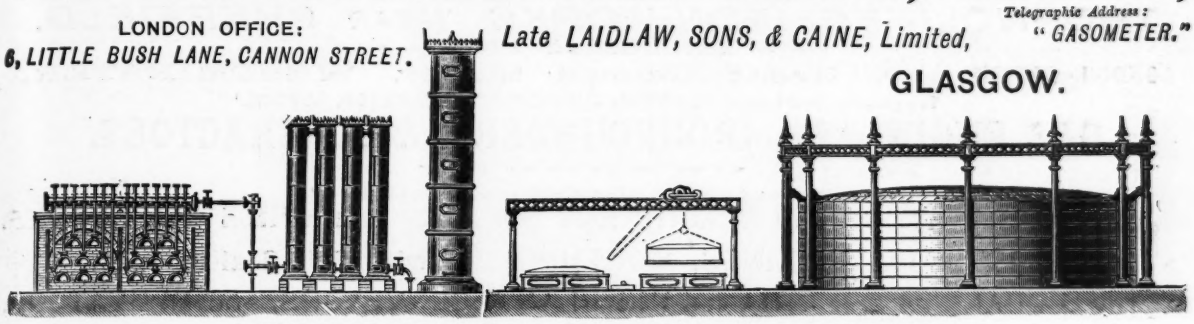
ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT-IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

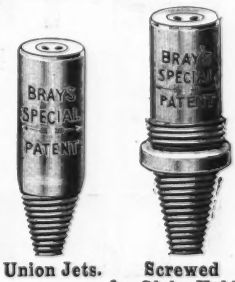
THE
WINSTANLEY SPECIALITY CO.,
GAS ENGINEERS, &c.

ERECTION OF RETORT-SETTINGS OF ALL KINDS UNDERTAKEN.

Specialists in Inclined Retort-Settings.
Contractors for Gas-Works Plant Complete.

ADDRESS—KENILWORTH.

BRAY'S "SPECIAL" GAS-BURNERS



Union Jets. Screwed for Globe Holder.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

Manufacturers of every description of

PLANT, APPARATUS, and MACHINERY for GAS and CHEMICAL WORKS.

RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

CONDENSERS, SCRUBBERS, and WASHERS.

PURIFIERS with Planed Joints a Speciality.

Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders. GAS COAL famous for its UNRIVALLED EXCELLENCE.

BRAY'S "SPECIAL" Gas-Burners.

Slit-Unions. Screwed for Globe Holder.

JONAS DRAKE & SON,

OVENDEN, HALIFAX,

HAVE ERECTED **500** OF THEIR PATENT

TUBE REGENERATOR

FURNACES DURING THE LAST **4** YEARS.

ESTIMATES ON APPLICATION.

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GEORGE ORME & CO.,

(BRANCH OF METERS LIMITED.)

ATLAS METER WORKS,

Telegraphic Address: "ORME, OLDHAM."
Telephone No. 93, OLDHAM.

PARK STREET, OLDHAM.

"NEW CENTURY" PATTERN

PATENT COIN PREPAYMENT GAS-METERS

FITTED WITH DETACHABLE ATTACHMENTS.

ARRANGED FOR 1d., 1s., OR ANY OTHER COIN DESIRED.

A large number of these Meters have been sent out this Year, which are giving every satisfaction.

Dry Meter in Tin-Plate Case, fitted with Attachment.

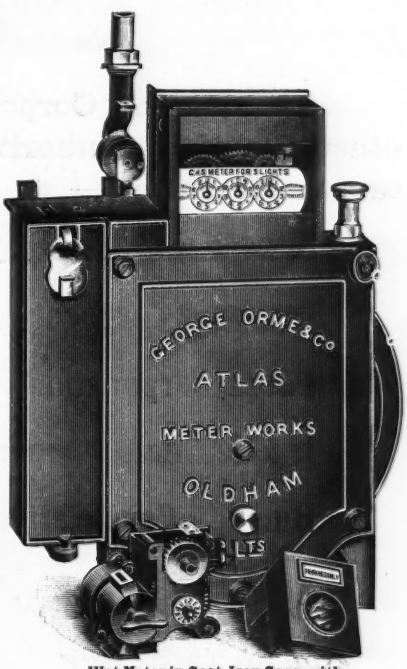
Price changed *in situ* by means of one Crown Wheel only.

COMPACT.

DURABLE.

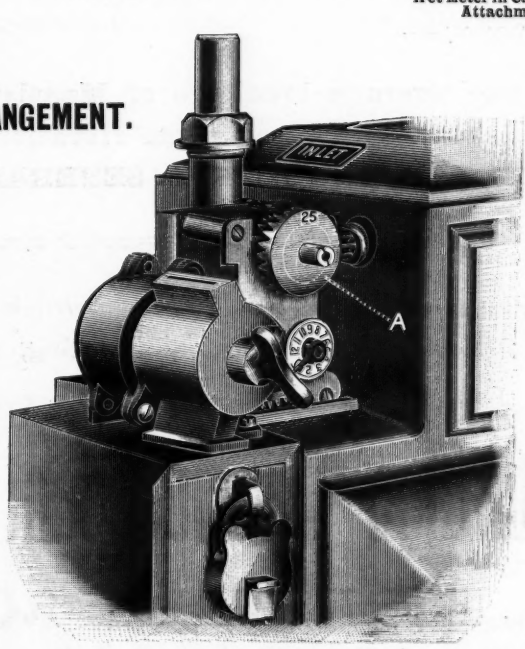
RELIABLE.

SIMPLE.



Wet Meter in Cast-Iron Case, with Attachment Removed.

VIEW OF PRICE-CHANGING ARRANGEMENT.



CHANGE OF PRICE EFFECTED BY SIMPLY REMOVING CROWN WHEEL "A" AND REPLACING SAME WITH ANOTHER WHEEL.

ANY FURTHER PARTICULARS WILL BE SUPPLIED UPON APPLICATION.

INCANDESCENT GAS LIGHTING A SUCCESS

BY USING THE

"AVIL" SYSTEM.

THE ONLY SUCCESSFUL ANTI-VIBRATOR ON THE MARKET, AND WHICH HAS STOOD THE TEST OF SEVEN YEARS' PRACTICAL USE.

Among the Corporations, Gas Companies, Railway Companies, or other Lighting Authorities who have extensively adopted our Frames are the following:—

Bradford Corporation (12,000),
Glasgow Corporation,
Leeds Corporation,
Huddersfield Corporation,
Burnley Corporation,
Midland Railway Co. (10,000),
Great Northern Railway Co.,
Manchester Corporation,
Salford Corporation,
Aberdeen Corporation.

Mr. Chas. Wood, Gas Engineer of the Bradford Corporation, and President this year of the Manchester District Institution of Gas Engineers, says:—

"The average breakage of Mantles on the Incandescent Burners "fitted with your Patent Anti-Vibration Frames has been LESS THAN "FOUR PER ANNUM FOR SEVERAL YEARS PAST."

For full Particulars of your Frames, which are alike suitable for Street and Factory Lighting, apply to

THE

Anti-Vibration Incandescent Lighting Co., Ltd.,

35, KIRKSTALL ROAD, LEEDS.

Telegrams "RESILIENT, LEEDS." Telephone 116.

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PATENT COKE-CONVEYOR

FOR ELEVATING AND CONVEYING

Supersedes all others for dealing Automatically with

HOT COKE.

THESE CONVEYORS ARE NOW AT WORK IN ENGLAND OR IN HAND AT THE FOLLOWING WORKS:—

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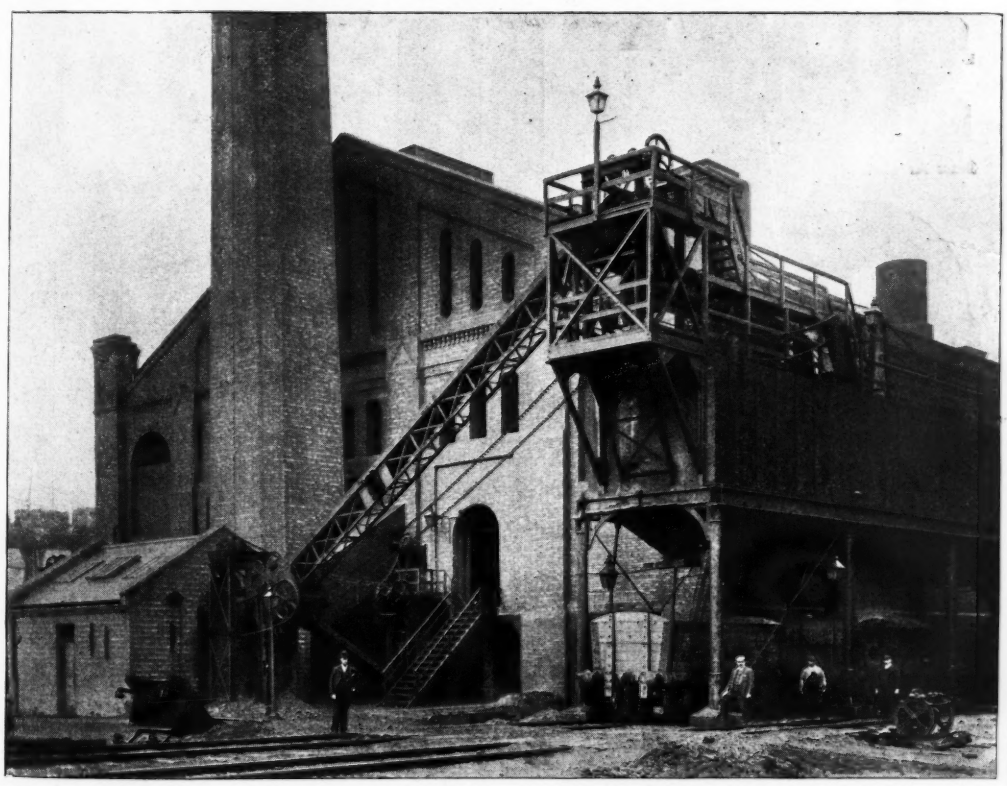
Birmingham Corporation, Saltley.
Gaslight & Coke Co., Shoreditch.
Newcastle & Gateshead Gas Co.
Gaslight & Coke Co., Nine Elms.
Halifax Corporation.
Wakefield Gas Co.
Walsall Corporation.
Bury Corporation, Lancs.
Derby Gas Co.
Bath Gaslight & Coke Co.



The De Brouwer Coke Conveying and Elevating Plant at the Newcastle and Gateshead Gas Company's Redheugh Works.

GUARANTEED BY SOLE MAKERS:

W. J. JENKINS & CO., LD., RETFORD.

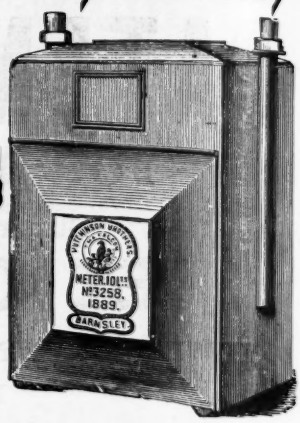
HUTCHINSON BROTHERS & CO., LTD.,

Gas Engineers, &c.,

MAKERS OF

WET & DRY GAS-METERS

BRASS MAIN AND LAMP TAPS,
UNIONS, FERRULES, &c.,
SERVICE CLEANERS,
SYPHON AND OTHER PUMPS.

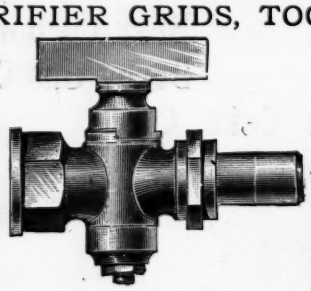


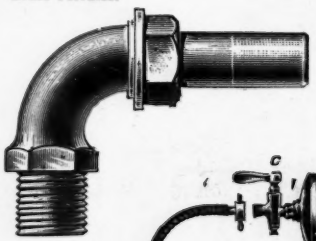
LEAD WORK FOR SULPHATE OF AMMONIA PLANTS

CHEMICAL LEAD-BURNING APPARATUS, COPPER SCOOPS,
PURIFIER GRIDS, TOOLS, & SUNDRIES FOR GAS-WORKS.

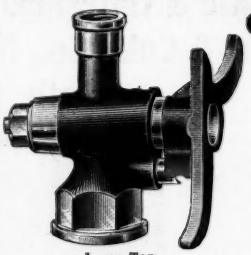
"Falcon" Lamp Torch.

Brass Ferrules.

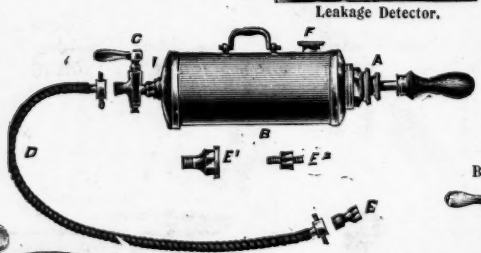

Main Tap.



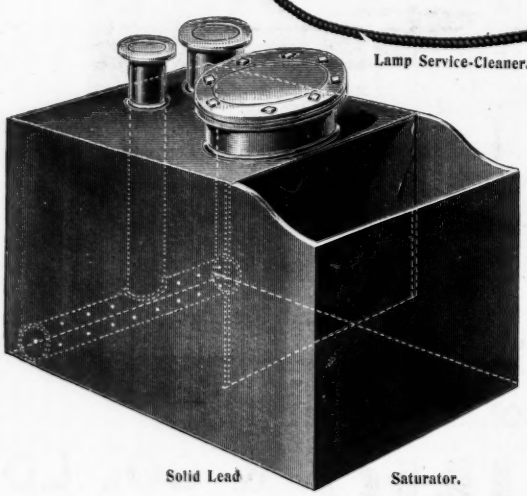
Leakage Detector.


Lamp Tap.

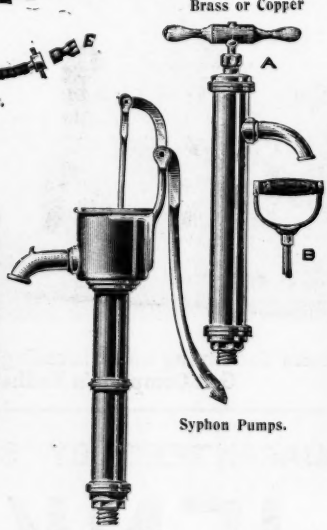
Service-Cleaner.



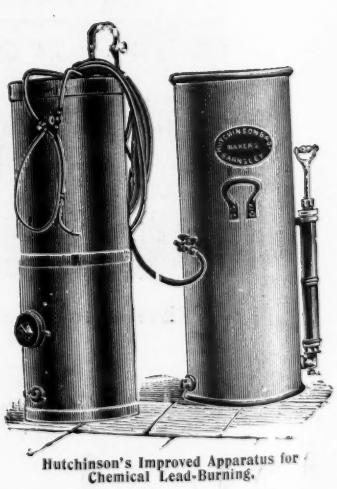
Lamp Service-Cleaner.


Solid Lead Saturator.

Brass or Copper



Syphon Pumps.


Hutchinson's Improved Apparatus for Chemical Lead-Burning.

Lists and Prices on Application.

FALCON WORKS, SACKVILLE ST., BARNSLEY.

Telegrams: "HUTCHINSON BROS., BARNSLEY." Telephone: No. 54 NATIONAL.

A. & J. STEWART AND MENZIES,

LIMITED,

MANUFACTURERS OF

WROUGHT-IRON WELDED

TUBES AND FITTINGS

OF ALL DESCRIPTIONS FOR

GAS, STEAM, AND WATER.

LIGHT LAP-WELDED WROUGHT-IRON AND STEEL TUBES

WITH STEWART'S PATENT FLANGED JOINTS.

HOT WATER HEATING TUBES

(PERKIN'S SYSTEM).

SOLID DRAWN STEEL TUBES

CAST-IRON PIPES

STEEL AND IRON PLATES FOR BOILERS, BRIDGES, &c.

OFFICES:

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"REGULATORS." "GAS ECONOMISERS." "ACETYLENE."

Union-Jet. Batswing. Slit-Union. **BRAY LEEDS.** Batswing. Slit-Union. Union-Jet. "Ceetee."

Telephone No.
756 BANK LONDON.

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[ESTABLISHED 1873.

Contractors to H.M. Government.

RETORT-SETTINGS

INCLINED, REGENERATIVE, GENERATIVE, AND FLOOR LINE.

SEVERAL THOUSANDS OF OUR SETTINGS IN SUCCESSFUL WORK.

Plans, Estimates, and full Particulars for Complete or Partial Erection and Renewal.

J. & H. ROBUS,

Engineering Contractors for Gas and Water Works,

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And GORING, OXFORDSHIRE.

GASHOLDER TANKS. RESERVOIRS.

MAIN LAYING. BORING. WELL SINKING.

WHY HAVE LEAKY SATURATORS?

For Reliable Ones, and all Repairs, &c.,

TRY

JOSEPH TAYLOR & CO.,

CENTRAL PLUMBING WORKS, BOLTON.

80 SATURATORS DELIVERED DURING THE LAST SIX YEARS.

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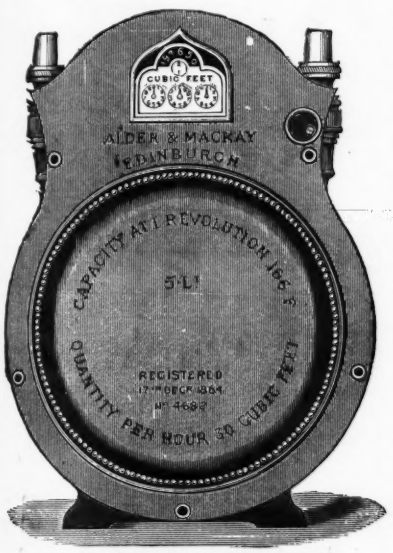
ALDER & MACKAY

(Established over Half a Century),

MANUFACTURERS OF

WET and DRY

ORDINARY & PREPAYMENT GAS-METERS



5-LIGHT CAST-IRON DRY METER.

PRESSURE GAUGES AND BRASS WORK.

2-LIGHT DRY PREPAYMENT METER.

ORIGINAL PATENTEES AND MANUFACTURERS OF

DRY METERS IN CAST-IRON CASES,

Especially suitable for Gas-Engines.

PATENT UNDERGROUND WET METERS,

Dispensing with the use of an Iron Box, Brick Chamber, or special Lamp Column.

WET AND DRY EXPERIMENTAL AND TEST METERS.

STATION METERS & STATION GOVERNORS.

PRICES AND ALL PARTICULARS ON APPLICATION.

NEW GRANGE WORKS,
EDINBURGH.
Telegrams: "ALDER."
Telephone No. 81 Western.

VENTNOR STREET WORKS,
BRADFORD.
Telegrams: "ALDER."
Telephone No. 1222.

13, VICTORIA STREET,
WESTMINSTER,
LONDON.
Telegrams: "ALDERUGI."

JONAS DRAKE & SON

OVENDEN,

HALIFAX.

Telegraphic Address: "DRAKESON HALIFAX."

Telephone No. 43, HALIFAX EXCHANGE.

Gas Engineers, Contractors, and ***Carbonizing Plant Specialists.***

INCLINED RETORT INSTALLATIONS ON *LATEST PRINCIPLES.*

RETORT-BENCHES and IMPROVED SETTINGS

WITH GENERATOR OR REGENERATOR FURNACES.

RETORT-HOUSES DESIGNED AND BUILT.

SELF-SEALING MOUTHPIECES, HYDRAULIC AND FOUL MAINS, RETORT-LIDS, CONDENSERS, SCRUBBERS, PURIFIERS, VALVES,

SPECIAL CASTINGS, GIRDERS, ROOFS, TANKS, COLUMNS, FLOOR-PLATES, CHARGING-SHOOTS, &c., &c.

FURNACE FITTINGS AND RETORT MOUNTINGS.

COAL AND COKE HANDLING PLANTS COMPLETE.

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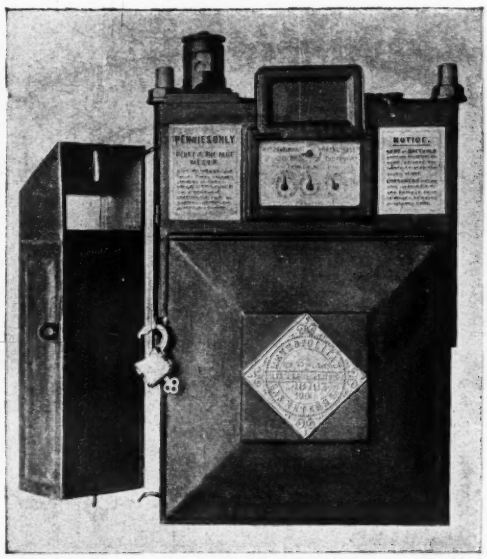
METROPOLITAN GAS METERS LIMITED.

MANUFACTURERS OF DRY ORDINARY & PREPAYMENT METERS.

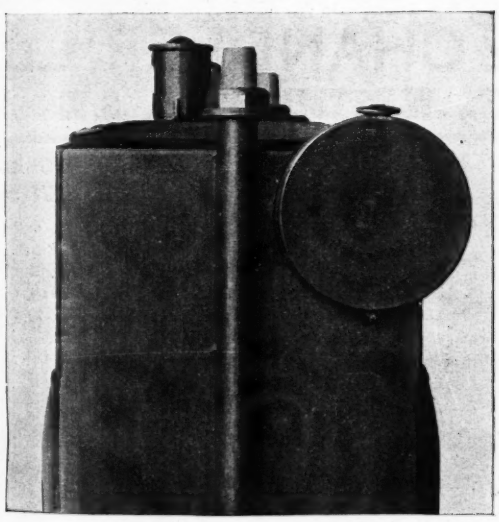
EXTRA LARGE. PATENTED.



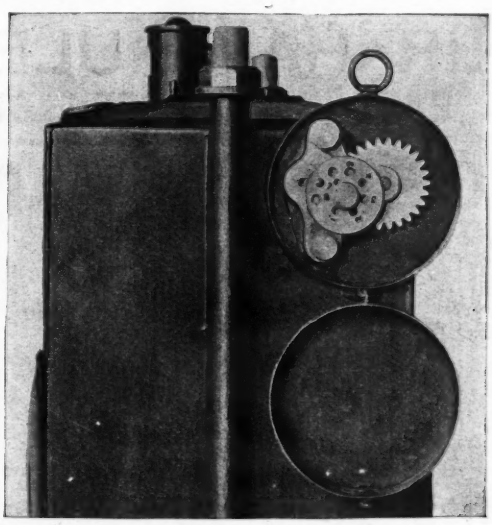
NOVEL & DETACHABLE MONEY-BOX.

PRICE CHANGER ON THE RIGHT OR OUTLET SIDE OF METER.

NO SCREW HEAD TO FIND UNDER WAX SEAL, MERELY LEVER UP SEAL RING.



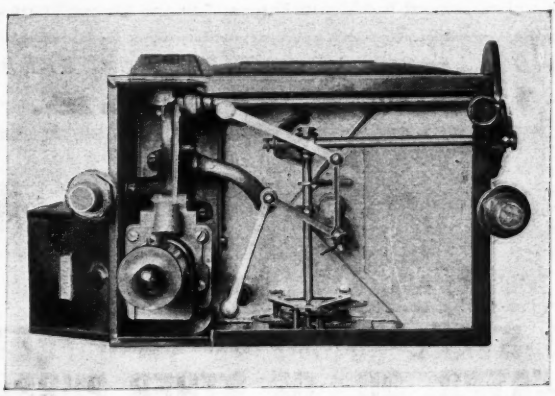
THE METER



POSITIVE CHANGE EFFECTED IN ONE MINUTE

ONE WHEEL TO BE REMOVED ONLY.

SIMPLICITY ITSELF.



ACCURATE VERY STRONG

Offices and Works: 62, GLENGALL ROAD, OLD KENT ROAD, S.E.

Telegraphic Address: "GASOMETER, LONDON." Tel phone No. 1260 HOP,

642,000,000

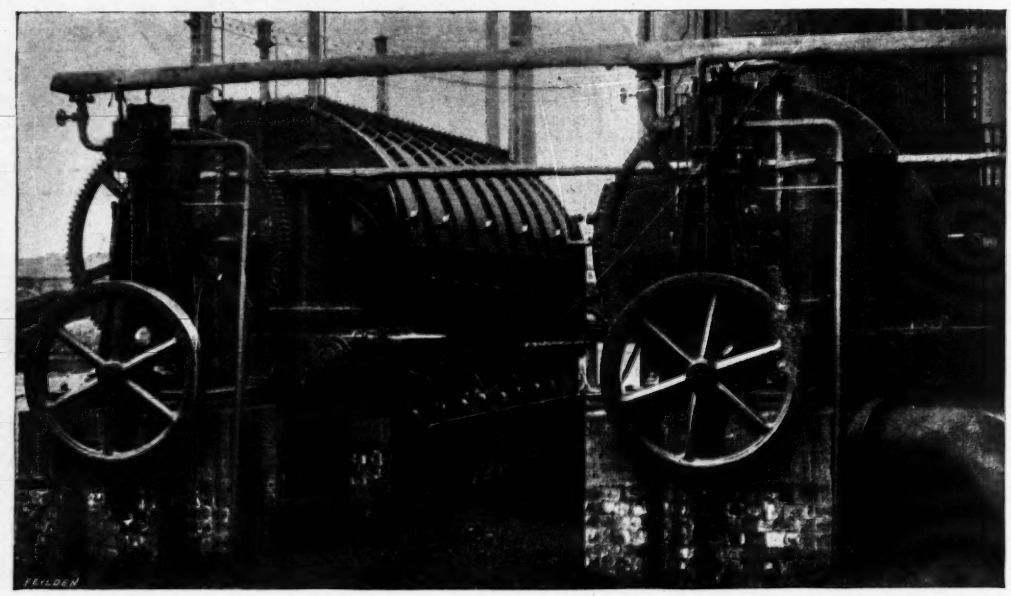
Cubic Feet of Gas per day are now being Purified by

PATENT "STANDARD" WASHER-SCRUBBERS

which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

Prevention of Slip of Gas Unwashed.

Strength of Liquor Concentrated.



Maximum Washing Surface.

Easy access to interior.

KIRKHAM, HULETT, & CHANDLER, LD.

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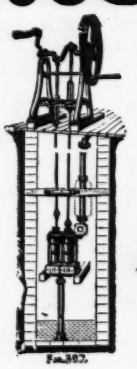

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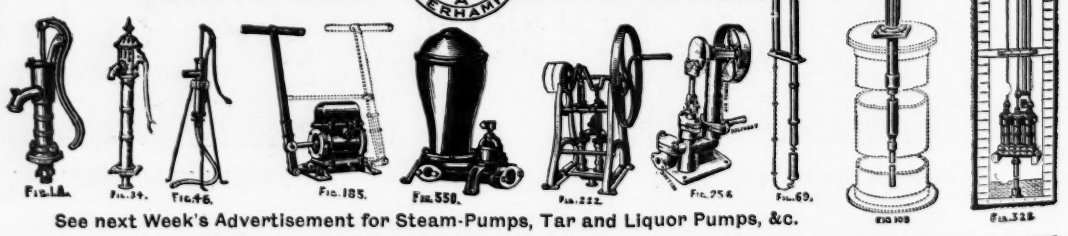

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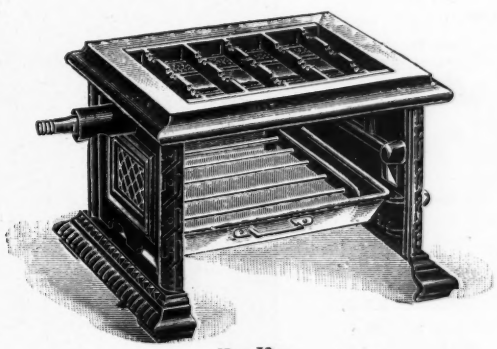

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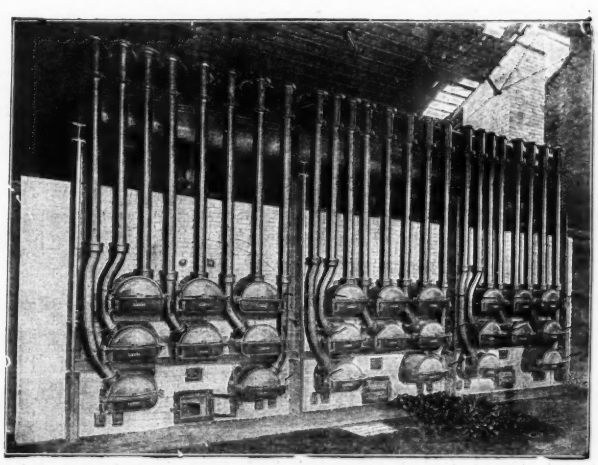

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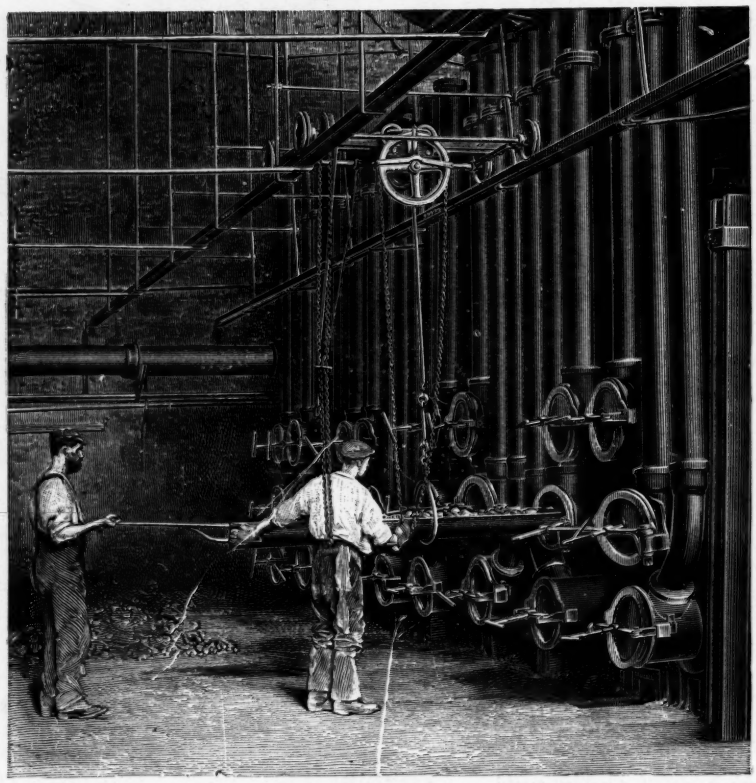

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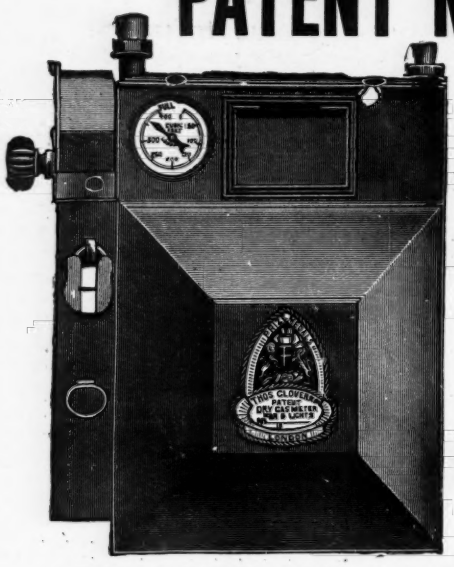

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1988.——TUESDAY, JUNE 18, 1901.

EDITORIAL NOTES.

The Meeting of the Incorporated Gas Institute.

THE meeting of the Incorporated Gas Institute last week was a very decided success in several respects. The President, Mr. T. O. Paterson, of Birkenhead, not only gave the members an excellent address containing something more than the usual morals and reflections; but his conduct in the chair was such as to put all the speakers at their ease. His presidential manner, in fact, was kindness itself. Happily for him, perhaps, there was no occasion during the three days' sittings for the display of that disciplinary authority which some of his predecessors in office have been called upon to exercise. The experiment of holding morning meetings only proved completely successful, having regard to the circumstances of time and place. London in the afternoon, during the season, is very pleasant; and afternoon discussions in summer are apt to be drowsy. The members attended these morning sittings with a most praiseworthy assiduity—indeed, the attendance throughout was remarkably full. Though the papers did not look very promising, by their titles, and the subjects raised for comment were practically limited to two—carburetted water gas and incandescent gas lighting—the discussions benefited by this concentration and the ample time allowed to every speaker. The formal part of the business of the meeting was of more than usual interest; and altogether the members spent a very helpful and pleasant time from start to finish. Of late years, everybody admits, the management of the Institute meetings has been all that could be desired; and this year's gathering was certainly no exception to this highly satisfactory rule.

As regards the matter that impended most threateningly over the meeting—the necessity for dealing with the question of amalgamation with the Institution of Gas Engineers, it is at least satisfactory to know that a definite decision has been arrived at. The majority of the members present at the meeting decided that if forcible parting with any of the existing members of the Institute was to be the price of union with the members of the Institution in a new Society, they could not pay it. The wording of the decisive resolution, moved by Mr. Chester, of Nottingham, was so ambiguous that no two men agreed as to its meaning; but the mind of the meeting was unmistakable. Here, then, ends the empty farce of negotiations which never had any heart in them. One cannot help thinking, that if all the parties to these negotiations were really and truly of one mind, an agreement would swiftly be consummated; but the contrary is the fact. The net result is that the gas industry of the United Kingdom is deprived at this critical period of a voice and a platform. Whosoever speaks, either to or for the Gas Institute or the Institution of Gas Engineers, has the paralyzing feeling that he has to do only with one portion of a divided house. The District Associations are in danger of dying of neglect, like children whose parents are at variance; and all this is because certain men in the profession do not like certain other men.

There is nothing else in it than that. The much-debated question of the "traders" is growing less of a reality, as a cause of division between the two Societies, every year. The Gas Institute is outgrowing this ancient affection. It ought not to be forgotten that this term of "trader" is chiefly allegorical. Grant that the seceders from the Gas Institute—for a totally different reason, be it remembered—were justified in saddling the thing indicated by the word "trader" with the responsibility for a great evil of which they wished to be free thenceforward, it is only fair to most of the prominent men who remained, to admit that they in their own way tried to excise it from the body of the Institute. The admission of "undesirables" into the Institute has stopped these many years. The haunting of the meetings of the Institute by commercial men of "shady" reputation has nearly ceased. Certainly, this year the trading contingent attending the meeting was both small and retiring. As time goes on, those traders who belong to the Institute will, of course, thin out rapidly; and unless the present temper of successive Councils changes, their places will not be filled up.

Meanwhile, those ancient members of the Institute, who, not wholly unjustly, lie under the imputation of being confirmed consorters with "traders"—eaters of their dinners, acceptors of their theatre tickets, willing senders-round of the hat for the wherewithal to raise local "welcomes" to the Institute—are dying out also. The younger members are not of this type. In the rank and file of the Gas Institute, not less than elsewhere, the spirit of self-respect which keeps the modern gas manager away from home from behaving like a bean-feaster, and a rough specimen at that, is well marked. These things are, after all, matters of individual culture, rather than of rules of membership of any society. In the course of a few years, it will be a matter of practical impossibility to discriminate between members of the Institute and of the Institution. Then, when the foreign element has eliminated itself, fusion will probably take place without any formal negotiations at all.

This is the most cheerful way of looking at the actual circumstances. Of course, those who are really and truly friends of the gas industry would much prefer to see it represented before the world by a single strong technical organization, with district branches, and an adequate research and instructional equipment. The annual or semi-annual meetings would then be as satisfying as could be wished. But this condition of things is not to be, for the present. There are some old rancours not yet dead, and some new manners not so amiable as might be desired; and the result is that the forces of the gas industry are divided and weakened before the world. Let us make haste to laugh at the spectacle, as the old philosopher used to say, lest we should begin to cry over it!

Reduction in the Standard Illuminating Power and Selling Price of South Metropolitan Gas.

NOTICE has been given by advertisement, as required by the Act of 1900, that from the 1st prox. the South Metropolitan Gas Company will reduce the standard illuminating power of their gas from 16 to 14 candles, and concurrently the price will be reduced 5d.—namely, from 2s. 8d. to 2s. 3d. per 1000 cubic feet. It would be superfluous to dilate on the interest of this announcement. We desire to direct attention, however, to the fact that the Directors have gone ahead of the Act, which only requires the standard illuminating power to be reduced to 15 candles at the date named, and allows three or four years more before coming down another candle. Having regard to all the circumstances, the South Metropolitan Board judged it expedient to make the whole stride at once, instead of taking it in two steps. The chief reasons that decided them refer to the exigencies of remodelling the routine of the works, with a view to the production of the lower quality gas at the cheapest cost; and the desirability of being able to claim the utmost relaxation of the official testing ordinances for the facilitation of these experiments. If the Company had gone to 15-candle gas, the Referees and the County Council would have interpreted their duty as requiring them to visit every deficiency of illuminating power with the extreme rigour of the law, heedless of the consideration that the standard would soon be set lower. That is the beauty of officialism. Now the Company will be absolved from penalty so long as the gas keeps above 13½ candles. Practically, of course, the gas will be actually above the legal standard of 14 candles for a considerable period; but, inasmuch as the Company have paid for the full length of the tether, they will have the laughing side of all photometric pedantry, portable or otherwise. It is scarcely necessary to remark that London gas manufacturers at present have no experience whatever of the wholesale production of gas of 14-candle power; but the Engineers of the South Metropolitan Company, under their Chairman, will soon learn. It will be amusing to see what the portable photometer will have to tell, when the new system is fairly started.

The Coal Market.

By this time, doubtless, the majority of gas undertakings have completed their contract purchases of coal for the ensuing twelve months—at prices very materially less than they were obliged to pay last year; but to those who have not yet bought, we may, perhaps, be permitted to give a word of advice. That is, to take no heed of the slight hardening of the market that has been noticeable during the past few weeks. There is no real revival in the coal trade. The recent spurt, such as it has been, was due to obvious causes, and is destined—as, indeed, it has begun—to die away and leave the market weaker than before. The activity observable since about Easter has been entirely due to the stimulus given to shipping by the fall in freights which coincided with the opening of the Baltic season. Coal has, therefore, been leaving the country at practically as rapid a rate during the past two months as during the same period of last year. This is evident from the Board of Trade returns for May. Although Whitsuntide fell in May this year, while it was in June twelve months ago, the quantity of coal purchased by other countries last month was greater than in May, 1900; the actual figures being 4,280,950 tons, as compared with 4,170,220 tons. Moreover, the shipments of "bunkers" show a rise from 1,044,660 to 1,223,196 tons. The total foreign purchases of coal during the first five months of this year amounted to 17,253,924 tons; in the same period of 1900, they reached 17,893,482 tons—a decrease this year of 639,558 tons. Bunkers, however, show an increase of 546,745 tons; so that the total quantity of coal shipped from this country up to the end of May reached within less than ½ per cent. of the shipments in those months of 1900.

There is, though, every reason to believe that during the remainder of the year a much more considerable falling off will be witnessed; for the Baltic season has practically come to an end at a much earlier date than usual—partly in consequence of buyers beginning the season with heavy stocks, and partly in consequence of the diminished activity of trade on the Continent. Seeing, then, how very considerable a fall there has been in the home market prices while exports of coal have been but slightly diminished (rates having only hardened a trifle when shipments reached the level of 1900), it is obvious that, when the decrease in exports reaches material proportions the home market will become easier than it has been since the "boom" began in 1899.

The main reason of the slackening in prices that has taken place already is, as we have frequently pointed out, the greatly diminished activity in the iron and steel trades. The Board of Trade returns for May give further evidence of this lessened activity. The shipments of pig iron in May, 1900, were 147,589 tons; but last month they only amounted to 103,632 tons, while for the five months the totals read: 1900, 674,031 tons; 1901, 362,506 tons. During the same period, imports rose from 39,092 to 54,805 tons; so that the demand on our iron makers was 327,238 tons less this year than last, equal to a reduction in their coal consumption of about 750,000 tons. Steel and manufactured iron also show decreased exports, coupled with increased imports, both for the month of May and for the five months; so that we shall not be far wrong if we say that the iron and steel trades have used, in respect of the altered conditions of our foreign trade, about 1¼ million tons less coal this year than they did in the first five months of 1900. Taking into consideration the further reduction resulting from diminished trade in the home markets—a quantity impossible to compute—the effect upon the coal market will readily be seen to have been very great. Now, given freedom from labour troubles in the mines—and they are not likely yet awhile to be on a very large scale, whatever they may be by-and-bye—coal consumers should not have a great deal to grumble at this year, unless the collieries still maintain their inability to distinguish between gas coal and brickbats. And that can soon be corrected now that buyers are on the right side of the hedge.

Tunbridge Wells Gas Company's Water Pollution Case.

Litigation over an alleged nuisance is one of the most vexatious experiences that can possibly afflict the administration of a gas undertaking. It is always tedious, costly, and unsatisfactory to an extreme degree, with no compensations of any kind. The Tunbridge Wells Gas Company have lately passed through an experience of this sort, which ended in nothing but waste of money. It appears that a certain owner and some occupiers of house property at Pembury, near Tunbridge Wells, drew water from a well 210 yards away; the pipe being carried along the highway in which the Gas Company's main also lay. It was found that the water became polluted with coal gas, which could only come from the Company's pipe; and accordingly the parties brought the matter into Court—probably on account of the unreasonableness of the complainants. It is impossible to help thinking, after perusal of the evidence, that the Company would have settled such a case outside if they could. Gas was found in complainant's water supply; and there, so far as the law went, was an end of the matter.

Still, some of the legal points so carefully expounded by Mr. Justice Farwell are worth noticing. The Company tendered evidence to show that they are under statutory obligation to lay pipes in the highway; that the pipes were well laid in the ordinary manner; that in the course of time impregnation of the surrounding soil with gas from such pipes is unavoidable; that the water-pipe in question was defective; and that the water was already unfit for domestic use. All this was ruled out as irrelevant. In carrying out their statutory obligations, gas companies must not create a nuisance. In this case, a nuisance was created; and the Company were chargeable accordingly. It did not matter that the water-pipe leaked, and that the water was already too bad to spoil. Gas had no business in it. As the Company had stripped their main, the nuisance was abated; and therefore the Court did not issue an injunction, but merely made a declaration that the Company are not entitled to pollute the plaintiff's water with coal gas. This judgment carries costs; but, of course, both parties have to pay somewhat smartly for a decision which does not add appreciably to the sum of human knowledge.

Let us take the present opportunity for remarking that this question of the permeation of the subsoil with gas from buried mains is going to be more rather than less troublesome in the future, with electric tramways running everywhere. It behoves all gas engineers to set up the highest attainable standard of staunchness of mains and services, for many reasons. These can, and should, be made and kept bottle-tight; and where this is done, there will be little unaccounted-for gas, and less consequential trouble.

Stock-Issuing Provisions of the South Metropolitan Bill.

The South Metropolitan Gas Company's Bill, as we have duly recorded, was passed by the Committee with certain alterations and emendations, some of which applied to the proposed manner in which the Company's capital powers are to be exercised in future. We purposely refrained from commenting upon this part of the Bill, for the reason that a renewal of the London County Council's attack upon the new provisions was to be expected. This expectation has been justified by the action of Mr. Lough, the member for West Islington, who, on the order for the third reading of the Bill, moved its recommittal with the object of getting the new arrangement upset. He failed, notwithstanding the support he received from Mr. Strachey, a member of the Committee upon the Bill; and the debate which we report elsewhere is well worth reading for several reasons. In the first place, the whole proceeding was of a piece with a very objectionable practice into which the House of Commons has been betrayed on some recent occasions—of reviewing, on the order for third reading, the provisions of a Private Bill which had been thoroughly gone into upstairs. It will be impossible to carry on the business of statutory companies if this abuse of the forms of the House is persisted in. There is good reason to believe that the Government are alive to the danger; and the large majority by which the third reading of the South Metropolitan Bill was carried is to be understood as an endorsement of the principle that the Committees of the House must be upheld. It is fair to suggest, also, that many of the members who supported the Committee's judgment on this occasion knew a good deal of the merits of the case. The South Metropolitan interest—Company and consumers and workpeople—are to be congratulated on this parliamentary triumph, which was admittedly gained for them by Mr. Livesey.

As regards the merits of the modification of the Standing Order relating to fresh stock issues, it is enough to say that it is strictly in accordance with the spirit of the Order and the obvious intention of Parliament, while it emancipates the Company from the bondage to the letter which the Stock Exchange has known how to turn to the detriment of the investment. Of course, this move on Mr. Livesey's part aroused the bitter hostility of the Stock Exchange interest, which thinks it has a vested right to knock down a statutory

company's stock when there is wind of a fresh issue. By a monstrous combination rarely seen, the Stock Exchange is at one in this matter with the Socialists of the London County Council, who hate the South Metropolitan Company and their Chairman with a bitter hatred, for having a happy and prosperous staff of workpeople free from Trade Union dictation. Mr. Thomas Lough, who undertook to move the recommittal of the Bill, is a Radical politician who once engineered a strike of London cabmen that shared the fate of the well-known South Metropolitan gas-stokers' strike. His seconder, Mr. Strachey, has similar political proclivities. When such politicians do agree with mere money-grubbers of the Stock Exchange, "their unanimity is wonderful."

However, the Company received their Bill unaltered by this desperate onslaught. It will enable them to issue fresh stock directly to those who are most interested in the prosperity of the undertaking; and the Stock Exchange will have to find some other stock to play with. There is, of course, no reason in the world why gas stock should not be issuable at a fixed price under proper conditions, although not all gas companies are in the position to be able to count upon obtaining any amount of money from their own consumers and workpeople. A point was made of the fact that, by the Bill as it passed the Committee, the Directors might issue stock at a small discount; but the technical ground for this elasticity was amply explained and defended by Mr. Livesey in his evidence. Most people will be inclined to declare that nobody besides Mr. Livesey could have moulded a Parliamentary Committee to his own views on such a matter; and there is very good reason for the opinion. At the same time, it must be freely allowed that the alteration of the application of the Standing Order is thoroughly justifiable. The difficulty in getting Parliament to modify a Standing Order, or make a precedent, lies in the circumstance that those who ask for this accommodation are necessarily interested parties. They naturally know more about the business than anybody who is merely an outsider; but unless the rare combination is secured of a strong Chairman of Committee and a witness whose good faith is as conspicuous as his knowledge, the tendency of the Committee is to keep within the letter of the Standing Order. In this case, the combination was found; and the logic of truth prevailed over the letter of the Order.

Devonport Corporation and the Gas-Works.

THERE was presented to the Devonport Corporation last Thursday a report with reference to the terms on which the negotiations for the purchase of the gas-works were settled. In substance, these are on the lines that were indicated in the "JOURNAL" for the 7th ult. (*ante*, p. 1183). The price to be paid by the Corporation is, in case of disagreement, to be settled by arbitration. The maximum dividends are to be deemed the dividends paid by the Company in the year ending May 31, 1900, which means that the "additional "shares" are to be treated as entitled to 10 per cent., and not to a maximum of 6 per cent. as contended by the Corporation. On the other hand, the Company are to forego their claim of £11,398 in respect to back-dividends. They are to retain the reserve fund of £5000, but to pay thereout the whole of their costs in relation to the petition to Quarter Sessions, the promotion of their Bill in Parliament, and the opposition to the Bill of the Corporation. An annuity of £150 is to be paid by the Corporation to the Managing-Director of the Company (Mr. A. Bennee) from the date of transfer. The debts and liabilities other than the mortgage debt are to be discharged by the Company, and a sum equal to their amount included in the purchase-money. No liability on capital account is to be incurred by the Company without the previous consent of the Corporation; nor are they to enter into any contract or agreement, except such as shall be in the ordinary course of the maintenance of the works and the proper conduct of the concern. Notice to treat for the purchase of the undertaking must be given by the Corporation within six months after the passing of the Act. In the absence of agreement, the transfer will take place on the 30th of June or the 31st of December next after the date of the arbitration award. At the request of the Gas Committee, the Town Council have confirmed them in office, and enlarged their powers. The Committee were appointed to carry through the promotion of the Corporation's Bill and the opposition to that of the Company. They are now empowered to continue the negotiations, arrange for the transfer, and generally to exercise the authority of the Corporation in respect to the conduct of the gas-works.

Resumption of Work at Bethesda.

THE excellent effect of the enforcement of the law in the Bethesda region was observable this day week, when, in accordance with the notice that had been given by Lord Penrhyn's Manager (Mr. Young), the slate quarry was reopened for work. It must have been a critical time for a good many people in this distracted country, so long given over to fierce factional disputes. The more or less respectable outsiders who have hitherto appeared to entertain distorted views of the power and scope of the law, must have thought better of it after the police court proceedings recounted; and no actual violence was offered to the quarrymen, who resumed their lawful occupations at the appointed time. It was stated officially that these numbered 600 men, who received a bonus of £1 apiece, and were granted a 5 per cent. rise of wages. It will take all the factitious operations that the strike organizers can devise, and pay for, to counteract this wise action of the management. Men deserve some consideration for acting counter to strong popular sentiment, however inspired. Lord Penrhyn met the men at the quarry, and highly praised those who had had the courage to assert their individual liberty of action in awkward circumstances. Some men who used to work in the quarry had left for their own and their employer's good. To them Lord Penrhyn had nothing to say. They are at liberty to please themselves. For the benefit of those who returned to work, and others who may come in later, Lord Penrhyn went on to declare that "they need no longer "be afraid of the sort of tyranny which they all knew had "existed long enough among them." That same evening, at an open-air meeting in the village, somebody interested in prolonging the strike said that "they had tried for ten years "to deal with Lord Penrhyn by fair means; but that had "failed." Evidently, the two speakers were agreed as to the fact; but they occupied different points of view, and therefore saw opposite sides of the shield.

The Directors of the Commercial Gas Company notify that the price of gas will be reduced from 3s. to 2s. 8d. per 1000 cubic feet after Midsummer.

Owing to the death of Mr. M. B. Dodds, J.P., the Clerk of the Tees Valley Water Board, they have been deprived of their legal adviser. Mr. D. D. Wilson, the Manager, has been entrusted with the clerical duties formerly discharged by Mr. Dodds, and legal assistance will be engaged when necessary.

Mr. Arthur H. Cane, Secretary of the Reading Gas Company, presided at the tenth annual dinner of the Institute of Secretaries last Wednesday; and, in responding to the toast of the evening, expressed regret at the recent death of Sir Courtenay Boyle, by which, he said, the public had lost a distinguished servant, and the Institute a valued friend and supporter.

Mr. Sidney O. Stephenson, son of Mr. Andrew Stephenson, has been selected to fill the position of Manager of the Tipton Gas-Works, applications for which were invited in the "JOURNAL" for the 4th inst. There were 21 candidates for the appointment, and six of them were selected to meet the Committee. Mr. Stephenson is at present with Mr. Thomas Glover, at West Bromwich. We heartily congratulate him on his success in securing the more responsible post.

Last Saturday, Mr. Edwin Smith, the late Secretary of the Birmingham Corporation Gas Department, was presented by his former staff with a pair of massive silver candlesticks, and an address setting forth the hearty appreciation of the staff of the many qualities displayed by Mr. Smith during his 23 years' secretaryship. A deputation, headed by Mr. A. W. Tooby, made the presentation to Mr. Smith, who, in a few well-chosen works, acknowledged the cordial feelings of members of the Gas Department towards him.

In the advertisement columns of the present issue of the "JOURNAL" appears an announcement of the Incandescent Trust, Limited, who are pursuing with some ardour the proposal to form a combination for testing the validity of the Welsbach 1893 patent. The Trust have undertaken to carry through any action brought against their policy-holders for the alleged infringement of the patent. It is pointed out by them that the injunctions advertised by the Welsbach Company are not binding upon any person other than those who have consented or who are privy thereto; and the fact that one or two persons have agreed to submit and have been restrained does not establish the validity of the so-called 1893 patent. The Directors of the Trust state that they are advised that the 1893 patent is invalid, and will not be upheld when properly contested in the Courts. Mr. Jonathan E. Harris, who has already had some experience in incandescent mantle litigation, is the Solicitor to the Trust. Our views in regard to this combination were stated in the issue for April 16 last; and, as then expressed, the sooner the disputed question is properly brought to the test, and the present uncertainty removed, the better.

WATER AFFAIRS.

The Forthcoming Meeting of the British Association of Water-Works Engineers.

THE proceedings at the Royal United Service Institution last week, the report of which occupies so large a portion of the present issue of the "JOURNAL," brought to a successful close the business submitted at the second of the two gatherings of gas engineers fixed to take place in the Metropolis this spring. We may now, therefore, give a brief indication of that which will occupy their colleagues in the British Association of Water-Works Engineers, who will hold their sixth annual meeting at Birkenhead from the 9th to the 12th prox., under the presidency of Mr. W. A. Richardson, M.Inst.C.E., the Water-Works Engineer to the Corporation. It is a somewhat curious coincidence that the chiefs of probably the two most important departments of the Corporation should occupy in the same year the foremost places in connection with organizations of their professional brethren; yet it is nevertheless the case. Mr. T. Ormiston Paterson, the Gas Engineer, as President of the Gas Institute, has just passed through a trying ordeal in which he acquitted himself admirably. His colleague will, in one respect, be more favourably placed, as no contentious matter is likely to come before him, so far as can be gathered from the programme issued by Mr. Percy Griffith, the Secretary. In virtue of his professional position, it is only natural that his Inaugural Address should include a description of the works of which he has charge; and there will doubtless be in his discourse many points of interest on prominent topics in connection with water supply. The technical portion of the proceedings will comprise a paper on "The Design, Construction, and Cost of Service Reservoirs," by Mr. William Ingham, of Torquay; one of the Past-Presidents of the Association—Mr. William Watts—will deal with the pollution of public water supplies; and Mr. A. G. Cloake will discuss the French practice in the manufacture of cast-iron pipes. In view of the importance of rainfall in relation to water supply, the lecture which Mr. W. E. Plummer, M.A., F.R.A.S., the Astronomer to the Mersey Docks and Harbour Board, is announced to deliver on this subject should prove a valuable addition to the "Transactions." Descriptions of the water-works at Wallasey, Warrington, and St. Helens are to be circulated at the meeting. In connection with the trip to Warrington, an opportunity will be afforded by Mr. J. Parry, the Water Engineer to the Liverpool Corporation, for an inspection of the Norton Tower, which is a conspicuous feature of their great undertaking. With the exception of the last day, which will be devoted wholly to St. Helens, the afternoons only will be kept open for the visits, of which there are a goodly number; and there will be the usual dinner on the evening of the second day.

Two London Water Companies' Meetings.

THE Chairman of the Southwark and Vauxhall Water Company—Alderman Sir H. E. Knight—and his colleagues on the directorate met the proprietors, at the half-yearly general meeting last Tuesday, in anomalous and exceptional circumstances, as he frankly confessed at the outset of his address. With revenue and profit advancing, they had less money to distribute as dividend; and consequently they had to ask the shareholders to accept one at the rate of 6 per cent., instead of the $7\frac{1}{2}$ per cent. paid this time last year. This reduction was not attributable to anything within the control of the Directors. For a quarter of a century they have been gradually bringing their plant and works into what the Chairman called an "unassailable position"—that is to say, a position which will enable them to thoroughly perform all their functions. The way in which this work has been carried out was effectually shown a few weeks ago, on the occasion of the visit to Hampton and Walton, at the latter of which places the reservoir extensions, which are the only works of any magnitude remaining to be carried out, are in progress. Before many years are over, therefore, the undertaking will, as Sir Henry put it, be safely "tiled in," and the full benefit of all the thought and care bestowed upon it by the Directors and their able Engineer (Mr. J. W. Restler, M.Inst.C.E.) will be experienced. But, unfortunately, the revenue has not increased lately to the usual extent, and the profit in the past half year was affected by abnormal charges—the higher price of coal representing a dividend of 1 per cent. on the accounts for that period. Then there was the loss of income arising from the cessation of the auxiliary supply furnished to the East London Company; and also an additional charge to be met of £640 on account of the Chamberlain's fund. The Company, as the Chairman acknowledged, are under a temporary cloud; and it is just at such a time as this that the Directors require the forbearance and encouragement of the proprietors.

A rather brighter story was told the next day to the shareholders of the Grand Junction Water Company by Mr. F. Tendron, the Chairman. Notwithstanding the high price of coal and the large amount expended upon the works, there was a surplus of nearly £63,000 available for dividend and interest, of which £41,332 could be used for the maximum dividend payable to shareholders entitled up to 10 per cent. The receipts amounted to 4·88 per cent. for the half year, or $9\frac{3}{4}$ per cent. per annum—the average for the three preceding years working out to 9 per cent., while the dividend paid has been only $7\frac{5}{8}$ per cent. The difference is explainable to a certain extent by payments made on account of interest for the Staines reservoirs works, which Mr. Justice Buckley has decided are to be borne by the revenue. Mr. Tendron animadverted, and very properly, upon the prejudice created against the London Water Companies by the speeches and actions of certain public men—not excepting several members of the House of Commons, as evidenced by the recent extension of the sterilization clause, and by some exaggerated remarks made upon the quality of the London Water Supply by Mr. M'Dougall, the Vice-Chairman of the London County Council. This gentleman impugned the character of the Thames water in terms which were scarcely justifiable in view of the knowledge which he, as a member of the Conservancy Board, must possess of the efforts made by that body, as testified by their annual report, noticed last week, to ensure the purity of the river. Mr. Tendron did not spare either Mr. M'Dougall or the "Lancet" for their remarks—and no wonder, as our medical contemporary characterized the Company's water as "the dirtiest in London," and then endeavoured to justify their assertion by a very weak explanation. This question of dirty water led Mr. Tendron to the question of the suggested new regulations and the use of cisterns, on which, as will be seen by our report, he offered some pertinent observations in support of the action of the Companies, and proved to demonstration that these bodies are not the grasping monopolists they are supposed to be. In the case of the Grand Junction Company, the outlay on the works had, he said, been £1,841,475, and the return had averaged, as nearly as possible, 6 per cent. per annum; and he questioned whether any tradesman whose business had been carried on for a hundred years in the West-end streets would be contented with such a return. It was true, he added, that the Company had been able to pay a dividend at the rate of 8 per cent.; but the return to the buyers of any of their stocks for more than twenty years had been less than 4 per cent.

The Management of the Welsbach Incandescent Gas-Light Company.—Shareholders of this Company who remember the circumstances under which Mr. H. L. Peters (Managing-Director) and Mr. Charles L. Samson were elected to take part in the management of its affairs, will view with no particularly comfortable feeling the announcement, which appeared in last Saturday's papers, that the two gentlemen named have sent in their resignations. To say the least, this action is significant, and cannot fail to produce some misgiving among those who had hoped for an improvement in the condition of the Company as the outcome of the management of Messrs. Peters and Samson. Both have been energetic in their work; and if their resignations mean that their anticipations have not been realized, we feel confidence in saying that the fault is not, at any rate, that of the first-named gentleman. The report of the Directors has just been issued, but it does not disclose anything—beyond the fact that there is to be no dividend for the shareholders—as to the cause of these secessions. The startling information, however, is given that during the year no less than five Directors have resigned; but as to the reasons there is nothing but silence. The shareholders will look for a satisfactory explanation at the forthcoming meeting. On Saturday the Company's ordinary shares fell $1\frac{1}{2}$ and the preferred 1, "on," it is reported, "the resignation of the Managing-Director"—leaving the price of the former at 15-18 per cent. Briefly given, the details of the report are: The business increased by 50 per cent.; but owing to the reduction of prices, the gross profits were only £122,793, against £159,029. The dividend on the Austrian share holdings was only £65,451, against £76,556. The Directors attribute £10,817 of the total decrease of £27,706 to trade allowances or stocks acquired before the reduction in prices, and £5785 for depreciation of materials in stock. The entire balance to profit and loss of £66,002, after paying debenture interest, is wanted for the further development of the business. Even the preference stock is left without dividend!

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE THIRTY-SEVENTH ANNUAL GENERAL MEETING,

HELD AT THE

ROYAL UNITED SERVICE INSTITUTION, WHITEHALL,

JUNE 11TH TO 13TH, 1901.

Mr. T. ORMISTON PATERSON, M.Inst.C.E., President.

REVIEW OF PROCEEDINGS.

THERE was a very good attendance of members at the opening meeting of the Gas Institute for the present year; and an unusual air of high seriousness pervaded the gathering which warmly greeted the President, Mr. T. Ormiston Paterson, of Birkenhead, upon his taking the chair in the hall of the United Service Institution. No one could mingle in the crowd without receiving the impression that there was some great business toward, which was amply justified before the day was out. Meanwhile the preliminary votes and formal resolutions were swiftly cleared away, and without loss of a moment of time, the President was free to enter upon the most exacting of his official duties, and the great opportunity for the disclosure of his professional personality—the delivery of that address which, it is tolerably safe to suppose, has rarely been absent from his mind from the moment when Fate led him to the assumption of the high office of which this is one of the responsibilities.

The address belongs to that category of presidential utterances in which a general discourse upon the history and developments of technical points is enriched by a considerable original contribution to the stock of available information regarding particular branches of the study. This is without doubt the best of all prescriptions for the composition of a satisfactory presidential address; and Mr. Paterson is to be highly complimented on the skill with which he selected his materials and compounded them, as well as upon their quality. Indeed, it is a long time since we had the pleasure of following such an interesting and instructive discourse. Hearing it, one received the impression that, whatsoever else might come of the Gas Institute meeting, this fruit alone of the organization fully justified the assembly.

Mr. Paterson's historical studies led him to one discovery which has not been published before, in similar theses. This was the curious fact that when Murdoch began his pioneering in gas manufacture, his raw material cost him about the same as the prices ruling before the last great rise in the gas coal market. Nor did the set-off from residuals differ greatly; for, though coke was the only saleable bye-product of coal carbonization, it realized 26s. 8d. per ton—thus almost covering the modern returns from tar and sulphate, which were then valueless. The difference between the cost of coal gas then and now is therefore not attributable to any reduction in the value of the raw material. It certainly is not due to cheaper labour. The oft-told tale of the antagonism of what passed for authority in science, in Murdoch's day, to the new industry, is repeated by Mr. Paterson, who, however, did not draw any moral from the story. A curious echo of the same spirit was heard at Westminster during the proceedings of the House of Lords Committee on the Manchester and Liverpool Express Electric Railway Bill, when witnesses were gravely cross-examined upon their notions of the effect of the compression of the air between two cars passing one another at speeds of 110 miles an hour.

When he returned from the library to the actual affairs of the day, Mr. Paterson was fain to confess that the birth-throes of the gas industry had been followed by a long period of drowsy contentment, which did not make for either technical or commercial progress. In too many instances, the advantage of statutory protection was relied upon to enable the business of selling gas to be conducted upon different principles from those governing other important supply enterprises—as, for example, the brewing trade. The President drew an instructive contrast between the safeguards and incidental charges insisted upon by gas companies, and the brewers' practice. It is not, as he was careful to admit, that the traditional charges of gas undertakings for meter-rent, the making of connections, and even for consumers' deposits, are essentially unjust; but they are impolitic. They must be borne out of the price of the article of sale. But just as it does not pay a shopkeeper to make a specific charge for delivering his goods, or for leaving on the purchaser's premises the necessary package, so gas undertakings will find it to their advantage to sink everything of the same kind in the price of gas.

On the subject of the modern development of the sale of gas for other than lighting purposes, Mr. Paterson is jubilantly optimistic. Speaking of Birkenhead, as is right and proper, he states that whereas in August, 1884, the normal night consumption was eight times that of the day demand, in the same month of last year the difference was not quite 2½ times. This is a tremendous showing, upon which the Birkenhead Corporation are to be heartily congratulated. It can mean nothing but good—being, indeed, one of those advances of modern material civilization which are without any visible drawback. If there is anybody who can show the slightest reason for dissatisfaction with such a change in the circumstances of the gas industry, or can plausibly plead that any difference in the character of the supply would have expedited the reformation, one would be glad to hear from him.

Moreover, it may be as well to lay stress upon the truth that this increased day use of gas, as betweeu the years 1884 and 1901, coincides with a more than doubled night use of the same supply. And Mr. Paterson definitely sides with those who would allow still greater facilities to consumers of gas for power and heat, in order to keep gas-works more equably employed all the year round, and help to disestablish the smoke nuisance. This mental inclination naturally predisposes the President to look favourably upon the cause of "light gas," which the events of the past year placed so strikingly in evidence. Accordingly, he has joined himself heartily with those who are disposed to place the calorimeter before the photometer as an indicator of the market value of town's gas. His experimental work in this connection, and the calculations which he has been minded to make thereupon, form the backbone of the address. They constitute the new and considerable original contribution to the available store of technical information which we began by signalizing as the great merit of the composition. It is important to mark that Mr. Paterson has checked by experiment the suggestions offered during the past year by several advocates of the production of "light gas;" and he unhesitatingly declares himself in favour of the sale for general purposes of unenriched coal gas. If uncarburetted water gas is added, for works reasons, this addition should apparently be restricted to 20 per cent. of the make, when the average calorific power of the bulk would be about 500 British thermal units per cubic foot. A novel feature of the President's work with the calorimeter is shown in the comparative tests of gas as made and as stored. The good offices of a gasholder could not be better displayed. Mr. Paterson's references to Mond gas, for distribution, are the reverse of complimentary. He is manifestly no believer in a gas sent out with 60 per cent. of inert, and worse than inert, constituents.

The following portion of the address dealt lightly with the question of education. It cannot be said that Mr. Paterson shed much fresh light upon this very frequently debated matter. His ideas of the correct schooling and training of boys of his own class are open to the classification "old fashioned;" but in very many respects they are not the worse for that. He repeats what Mr. Woodall had to say the other day about the supreme importance of character to those who would fit themselves for responsible posts in the gas industry. Perhaps the most significant part of this section of the address is the omission of any hint that the organization of the Institute might be made available for improving the technical instruction of students of gas engineering. The President did not betray any consciousness of the truth which is being borne in upon many people, that enough is being done for the dissemination of primary school teaching, and that the need of England is now for the better equipment of those whose native powers have prepared them for the leading places in the industrial world.

The address concluded with a few remarks upon the subject of the amalgamation of the two organizations of the British gas industry which were more pertinent to the

moment of their utterance than of permanent interest. At any rate, the subsequent discussion went far to obliterate the memory of all personal and prior observations on the subject. Mr. Paterson must be accorded a high degree of credit for his ability in making his address so interesting as it unquestionably was to the audience, having regard to all the circumstances.

The vote of thanks to the President for his address was moved, in accordance with custom, by an ex-President, Mr. C. Stafford Ellery, which was an especially happy nomination, seeing that Mr. Ellery's own researches in gas manufacture have been upon parallel lines to those followed by Mr. Paterson. A pertinent inquiry by Mr. Ellery elicited an explanation that materially elucidated some of the most striking of Mr. Paterson's experimental results.

Immediately after this meritorious performance came the big business of the meeting—the submission of the report of the Council upon the protracted negotiations with the governing body of the Institution of Gas Engineers for the amalgamation of the two Societies. That this portion of the transactions was regarded as of the greatest moment was manifested by the close attention with which the very long statement, most carefully read by the efficient Secretary, Mr. W. T. Dunn, was followed by the large audience. Both at this time and subsequently, the spirit and temper of the members generally, in face of what was evidently felt to be a crisis in the history of the Institute, were admirable. Having regard to all the circumstances, we propose to continue for the present in the attitude of reserve in respect to this thorny matter which the "JOURNAL" has preserved ever since amalgamation was made a question of practical politics between the two Societies. All the same, it can do no harm to direct our readers' special attention to the remarkably able speech of Mr. Carter, of Lincoln, which was instinct with the true statesman's spirit. Concerning all the rest of what was said we shall offer no other observation, except to record the salient fact that it ended in nothing. It was easy to gather that the meeting was divided between those who desired union with their professional brethren of the other companionship, at almost any sacrifice, and those who had no heart for it, except upon terms which everyone knew amounted rather to surrender than to agreement. Consequently, the upshot was inevitable. The official movement towards unification of the gas industry of the United Kingdom was effectually killed by Tuesday's doings; and what is to happen next must be disclosed by time.

Wednesday's meeting opened with the lecture by Dr. Frank Clowes, which was intended to explain, and by inference to recommend, the latest form of the Referees' table photometer. This would have been all very proper and acceptable; but Dr. Clowes, who has become a partisan since his tenure of office under the London County Council, thought fit to drag into his lecture a gratuitous attack upon the London Gas Supply, with a thinly veiled aspersion upon the doings of one of the Companies. It is certain that if the authorities of the Gas Institute had known the use which Dr. Clowes intended to make of his lecturer's immunity from criticism, they would never have sanctioned this occupancy of their platform. As it was, the only effect of this questionable performance was to confirm the previous impression of those present—not one of them happening to hold a Metropolitan appointment—that the portable photometer is a "freak" which they may be thankful to know only at a distance. Dr. Clowes having departed, the meeting thoroughly enjoyed Messrs. Langford and Porter's papers on carburetted water gas. The discussion was extremely lively; and we shall hope to take another opportunity of commenting upon the subject. This somewhat trenchant criticism of carburetted water gas undoubtedly went far to clear the technical atmosphere, which has been not a little foggy hereabouts.

The first business on Thursday was a motion to consider the question of the standardization of gas meter-unions, which led to the most informing debate hitherto held on the subject. This was followed by the three papers dealing with various aspects of incandescent lighting, which were taken together. Again, the discussion was extremely good; and it had the result of establishing a distinctly advanced body of opinion in regard to the subject-matters brought forward. We may return to these at greater length later. The sitting this day was a very long one, being the last of the meeting. A special feature of the proceedings was the appearance on the platform of Mr. James W. Helps, in his capacity of Honorary Secretary to the Committee for the Glasgow Engineering Conference, in order to acquaint the members of the Institute with the actual condition of the arrangements for this gathering, which already seems to have attained somewhat unwieldy proportions.

The election of Mr. S. W. Durkin as President of the Institute for the ensuing year was a popular choice; and the consequent selection of Southampton as the place of meeting was carried by acclamation. The customary complimentary votes were passed with more than the usual warmth; everybody feeling that the meeting had been a highly successful and most pleasantly conducted one throughout. The excursion by steamboat to Herne Bay was well patronized, and was favoured with bright though cool weather.

The only drawback to the success of the transactions of the meeting was the absence of a gas supply to the hall of the United Service Institution, which is an old subject of complaint on the part of those wishing to illustrate lectures or papers with experimental demonstrations.

THE PROCEEDINGS SUMMARIZED.

[*The Usual Full Report Commences on p.* 1635.]

TEN minutes before the time appointed for the commencement of the sittings on Tuesday morning last, there were, in addition to the Council of the Institute, only a few loiterers in the precincts and rooms of the Royal United Service Institution, and to within two or three minutes of 10.30, the number of members had only moderately swollen, and the promise of a large attendance was not of the brightest. But there was a sudden change in the aspect. The incoming of members hastened; and the succession was so rapid that by the time the President (Mr. T. O. Paterson, of Birkenhead) ascended the platform, the hall was practically filled. The President was accompanied by his predecessor in the chair (Mr. E. H. Stevenson), the Honorary Secretary (Mr. J. Davis), and the Secretary (Mr. W. T. Dunn). The new Honorary Secretary has thrown a large amount of energy into the work of his office; and throughout the sittings he rendered admirable aid in their conduct. It was remarked, with regret, that the former occupant of the position, Mr. A. Dougall, jun., was unable to be present at the opening meeting; his presence, we believe, being required in connection with certain legal proceedings in which his Company were concerned. Among the visitors were noticed the brother of the President (Mr. R. O. Paterson, of Cheltenham), who was welcomed by numerous personal friends, and Mr. James W. Helps, the sincerity of whose work in the cause of amalgamation is, and must always be, freely recognized.

A LOYAL ACT.

The President, on rising, was accorded a flattering reception; and he, in turn, thanked the members for their numerous attendance. His first duty was to move a resolution expressive of the sympathy of the Institute as a body with the King and Royal Family on the death of Her Majesty the late Queen, and the good wishes of the members on the accession of His Majesty to the throne. This act of loyalty was consummated by the members standing.

AFFAIRS PROSAIC AND OTHERWISE.

Before more important matters could be reached, there were a few general items to clear from the *agenda*. First there were the minutes of the last general meeting, which were taken as read. Then Scrutineers were appointed; the choice of the members falling upon Mr. S. S. Mellor and Mr. Frank Clark. The report of the Council (the features of which were noticed in the "JOURNAL" for the 28th ult.) was adopted; and then the presentation of the accounts brought before the members two old pillars of the Institute, Mr. John West and Mr. Joseph Hepworth—the one moving and the other seconding the adoption of the statement, which discloses remarkable financial stability. Next came the presentation of awards for the papers read at last year's meeting. Curiously, the recipient of the President's medal and cheque for £10 twelve months ago was the President of this year; and it was upon him that the pleasurable duty devolved of handing a similar award on this occasion to Mr. W. R. Chester for his paper on automatic stoking and inclined retorts. The second premium fell to Mr. William Young for his contribution on naphthalene; and he had kindly requested that the cheque should

be placed to the credit of the benevolent fund. Mr. A. T. Walmisley's paper on retort-house roofs secured the third premium; but he (like Mr. Young) was not present to hear the members' endorsement of this recognition of their contributions to the "Transactions" of the Institute.

The Presidential Address.

As will be seen by the preceding review, and the text published in last week's issue, the President was happy in the selection of the subjects with which he composed his address. He showed a care in meeting the varied tastes of his audience and readers. The historical part meets the fancy of some; the question of day load *v.* night load appeals to the managers whose inclinations run more on the line of business development than scientific inquiry; the careful notes and experiments on the increasingly important question of the calorific values of gases gratify the student and investigator; and the educationalist finds towards the end of it some points for reflection. The concluding words had reference to the amalgamation question; but their strain did not reveal any great hopefulness on the part of the writer, nor were they such as to inspire confidence in the breasts of those who have a desire for unity. The acknowledgment of the members to the President for his address was moved by Mr. C. S. Ellery, who happily remembered, and reminded those present, that the Paterson family have laid the members under a debt of obligation for the active part they have taken in the work of the Institute. With Mr. T. O. Paterson, the presidential triad in the family is completed—the venerable Mr. James Paterson having been President in 1875, and Mr. R. O. Paterson in 1883. In suitable words, Mr. J. Carter seconded the motion; and it received a cordial confirmation at the hands of the members.

Amalgamation—The Locking of the Door.

The time had now arrived when the members were to decide whether they should make possible or impossible the long-talked-of amalgamation with the Institution. On the President calling upon the Secretary to read the report of the Council, there was a little falling away from the strict decorum which had pervaded the meeting to this point. For a short space, there was the sibilant sound of undertone conversation from all parts of the room; and the Secretary was well on to the second page of the report before there was absolute quiet again. Then grave attention was given to the Council's statement, which here and there was marked with approbation and occasional dissent from different parts of the hall.

In view of the publication already made in the "Journal" on the subject of the amalgamation negotiations, a summary covering the whole of the report is uncalled for. There are, however, a few points which have a bearing on the charge that the now notorious communication of the Council to the Institution dated February 26 was a withdrawal from the former grounds of negotiation and from the draft rules agreed to last year by both bodies, and really a reversion to the *status quo ante*. Looking into the portion of the report dealing with the conference of the two Councils on Feb. 9, we find these words: "The principal question at issue, it was felt, was the retention or otherwise of the extraordinary members and associates, or at least those of them who were [are?] associated with trade. This matter your Council had carefully considered at a previous meeting; and they had come to the conclusion that it would be their duty to *decidedly recommend* the acceptance of the names as they stood." The literal interpretation of the words "decidedly recommend" is conclusive; and therefore, so far as this particular point goes, it can hardly be argued that the Institution were wrong in taking the letter of Feb. 26 as an "*ultimatum*" from the Council of the Institute. The report again shows that the latter were willing to yield to the Institution the freest action in connection with the minor questions of dissolution and name, "provided the list of names could be adopted in its entirety." The suggestions in the letter on the points of dissolution and name, it is stated, were made in the belief that such a course would be the best means of bringing about union, and not with any idea of insulting or humiliating. "The letter," it is added, "was never intended as a full and complete statement to be submitted to the members of the Institution," nor (the word is used later in the report) as an "*ultimatum*." In such a momentous matter, this should have been made perfectly clear in the communication. If it had been, it would have lessened the ground for provocation; and much that was said on May 1 might have been left unuttered. The fault for what happened on that date therefore rests with those who drafted the letter of Feb. 26. Of the correspondence subsequent to May 1, our readers have full knowledge; excepting the last letter of the Council of the Institute, in which they informed the Council of the Institution that they would be quite willing to consider for election to the proposed new Society as honorary members the names of those gentlemen who have rendered distinguished service to the gas industry, and in addition Past-Presidents of the Institute and the existing honorary members. The response made to this by the Council of the Institution, which was not received in time for inclusion in the report, was to the effect that they were prepared to accept the suggestion that, in addition to the election as honorary members of all Past-Presidents of the two bodies, the existing honorary members of the Institute should be honorary members of the united Association; and they were willing to add to clause 7 of the proposed Articles of Association, words as to the election of gentlemen "who have rendered distinguished service to the gas industry." The letter also pointed out that among the associates Professor V. B. Lewes, not being a trader, would be eligible for election. The assertion in the report that at the conference, on the question of the retention of traders, "the Council received the impression that the Council of the Institution were at one with them," the letter stated, was contradicted by a later remark in the report that "there was no expression of opinion from the Council of the Institution as to what their desires were."

Although not connected with the report, it may not be out of place here to remind readers that, in the draft scheme of amalgamation which was adopted by the Institution and Institute last year, there appeared a clause which excluded from membership persons "actively engaged in or about the management of business, either as principal, managing-director of a joint-stock company, or as agent, or traveller of any trading company, firm, or concern doing business with gas undertakings, whether as vendor or as purchaser." This should be borne in mind in reading the discussion, as the position of the Institution to-day in the matter shows that they have not adopted that inflexible attitude which some of the speakers attributed to them.

Apt at broadly grasping a situation, and giving a clear utterance to his views, no better man than Mr. J. Carter, of Lincoln, could have been asked to move the adoption of the report. His was a difficult task, but he discharged it with an adroitness which was freely acknowledged. As he truly said, the Institute had arrived at an important and epoch-making moment. "What we do to-day," he warned his hearers, "may determine the question not only for this year, but for many years to come." When we look at what was done, these words assume an almost prophetic interest. On the all-important question of traders, he said the Institute, as existing to-day, are not responsible for the difficulty confronting them. When the Institute, he reminded the members, met in a certain Midland town some years ago, a very considerable addition was made to the roll of associate members by the admission of a number of gentlemen whose connection with the gas industry was a commercial one; and he desired that it should not be forgotten that the policy which governed the Institute in that year was dominated by gentlemen who to-day occupy prominent positions in the Institution. He admitted that subsequent observation may have shown them that they then made a mistake. However, the difficulty having been left with the Institute, he thought the Institution should deal with it a little less harshly than in the way they proposed. While preferring that the list of Institute members should be adopted in its entirety, he recognized the fact that this is impossible. The Council of the Institute, he pointed out, have admitted that there are members on the list whom it might not be desirable to retain; and in a peroration (which was worthy of the applause it elicited) he asked the members to be satisfied with the efforts that had been made, and to give the Council a little more ground in order that their work might be crowned with abiding success. Quite a dramatic touch was given to the discussion by the intervention of Mr. H. J. Davis, who magnanimously stated that he recognizes that it is really the "unfortunate" traders who are the stumbling-block to unity in the gas profession; and he offered, if it would conduce to the bringing about of that "highly desirable" end to tender his resignation. The motion found a seconder in Mr. James Stelfox. His view was that it would be an invidious thing to make a selection of those gentlemen who should or who

should not be admitted to the new society; and, looking back over the past, he thought the whole of the members of the Institute might be taken into the new society, and then a regulation applied to future admissions. Matters were introduced by Mr. C. E. Jones which bore upon the general question of amalgamation (the principle of which was agreed to last year), and had no reference to the point at issue as raised by the report, to which he gave his support. Not many members, however, took Mr. Jones seriously.

Mr. E. H. Stevenson raised to the surface a point which other speakers apparently overlooked in regard to the exclusion of traders. He mentioned that after last year's meeting the Council reopened the discussion with the Institution with the proposal that it should be optional for the Council of the new Association, with the apppoval of the members, to re-elect any person who belonged to the Institute or Institution who, in their opinion, had in the past rendered such service to the gas industry as warranted his election or re-election. Then again in a letter subsequent to the last meeting of the Institution, the suggestion was made by the Council that gentlemen who had occupied the presidential chair of the Institute should be elected as honorary members, as well as gentlemen who had rendered distinguished service to the industry. The last letter from the Institution agrees to these proposals; and therefore as the report stands Mr. Stevenson failed to see any difference between the two bodies. Mr. D. Irving characterized the last letter from the Institution as an admirable one. He thought the Institution had shown a sincere desire to meet the wishes of the Institute, and also that a great deal of the difficulties that have arisen are to be traced to the letter of Feb. 26. The profuse discussion on the report terminated in its adoption.

There, however, the matter did not end. In Mr. Chester's view the adoption of the report left the matter in a very indefinite position. He therefore put forward a resolution endorsing the efforts made by the Council to bring about amalgamation; and, while re-affirming the opinion that amalgamation is desirable, requesting the Council to endeavour to bring it about on the basis of the inclusion of all classes of members of both the Institute and Institution. He essayed to show that the concession of the Institution did not amount to much, seeing that in the list of honorary members there were only three living Englishmen; but he left out of consideration the point as to the willingness of the Institution to admit gentlemen who had rendered distinguished service to the industry. An amendment was moved by Mr. Irving, to omit the final words "on the basis of the inclusion of all classes of members." The arguments which were advanced by him, and his seconder Mr. F. W. Cross, are obvious. Mr. R. G. Shadbolt gave his adherence to Mr. Chester's resolution; while Mr. Isaac Carr made a very sensible appeal to the members not to tie the hands of the Council, but to leave the matter free and open as proposed by the report. Mr. William Carr defended the Council's letter of Feb. 26, stating that they had been carefully through the lists, and there were so few names that could be erased that it was hardly worth while to turn those associates out. There had been no additions to the class objected to since 1897; and, in the natural course of things, the number would gradually be reduced. While he hoped and trusted amalgamation would come about, he supported Mr. Chester's resolution, on the understanding that it still offered an open door for negotiation. He mentioned Mr. C. C. Hutchinson, Mr. Thomas Duxbury, and Mr. Thomas Fletcher as gentlemen whom the Institute would be loth to lose. That it would be unfortunate to tie the hands of the Council was the opinion of Mr. G. R. Hislop; and Mr. T. Berridge was not, we fear, far wrong in predicting that the passing of the resolution would put off amalgamation for ten years. Mr. J. P. Leather, agreeing with the resolution, considered it might be varied so as to express the opinion that the Council should endeavour to obtain the retention of the existing members. Another member strongly in favour of amalgamation is Mr. W. W. Hutchinson; but he likewise supported the motion. Mr. W. Hardie, on the other hand, urged the members to be careful about accepting it. Mr. Child countenanced the motion, saying that the members were willing to give away almost everything but their old friends. Mr. R. Porter and others added to the discussion.

On the amendment being put, it was rejected; and a similar fate befell one proposed by Mr. Leather, who sought to alter the concluding words of the resolution as he previously suggested. Mr. J. C. Belton and Mr. W. Higgs were heard upon this amendment. Eventually the motion was passed; and with it, many think, the prospects of amalgamation have been destroyed. In fact, in conversations at the end of the meeting, the view was freely expressed that union is dead; and one member was overheard to set a time-limit to his membership of the Institute if there is not a fusion within that period. However, the next step will be eagerly looked forward to. One natural suggestion is that there should be another meeting between the two Councils; and settle once and for all whether there can be union which would come within the terms of the mandate of the members of the Institute. Correspondence would only cause a further wearying protraction. [Just before going to press, we hear that a movement has been made which is likely will end in a conference of the Councils.]

The proceedings were not carried further at Tuesday's meeting than the disposal of the amalgamation question. The attendance on Wednesday morning was considerably lessened; the distribution of medals by the King to returned South African troops, on the Horse Guards Parade, offering, we are afraid, a counter-attraction. To those members who felt the meeting had first claim upon them, the morning's technical fare was of an interesting and satisfying character. First Dr. Frank Clowes, the Superintending Gas Examiner to the London County Council, lectured on

The New Table Photometer and Pentane Ten-Candle Lamp.

The lecture bore the distinction of independence in the technical matter brought before the meetings; but it cannot be said that it introduced anything in the way of novelty to the gas profession. It was in large part descriptive of the new table photometer and pentane ten-candle lamp; and had Dr. Clowes stopped at these subjects, the text of the lecture, his lucid and detailed explanations outside the prepared composition, and his demonstrations, would, combined, have formed an instructive and valuable contribution. But there was an interpolation of an unjustifiable character, which in the first place was not covered by the title, and in the second the circumstances and the occasion prevented any reply from those interested. To put it mildly, an unfair advantage of his position was taken by Dr. Clowes. Behind the screen of his description of the table photometer and pentane lamp, he managed to drag in that nomadic and unconventional invention of modern times, the portable photometer; and later on he showed by the aid of diagrams the curious discrepancies which are found between the tests made by this adventurer and the photometers in the fixed testing-stations. Of course, in the lecturer's view, it was not the portable photometers nor the conditions under which they are used that accounted for the deficiencies; but it was the gas supply itself which fell short outside the testing-stations of the standard set by Parliament, while it more than met the requirements inside. If there is one thing that can be admired about this part of the lecture, it is the temerity of Dr. Clowes in championing the claims of this wandering photometer before an assembly of gas engineers—no timorous man would have essayed the task. Had the matter been open for discussion, we venture to think there would have been grave disapproval evinced at this part of the lecture. As it is, it can only be taken as another chapter in the crusade of the London County Council against the London Gas Companies.

The lecturer opened with a statement of the conditions applying to the testing of gas in London; and the mere statement that there are 23 properly equipped stations at various points in the gas-supply district was no doubt sufficient to show the gas engineers present that the interests of the consumers are already amply safeguarded without the infliction on the suppliers of the roving photometer. He then referred to the provision (in the Act of Parliament governing the system of gas testing in the Metropolis) for the appointment of three "duly qualified" Gas Referees; but the question as to whether they are all "duly qualified" did not, happily for Dr. Clowes, fall within the scope of the lecture. However, the Referees, in the exercise of their powers, have prescribed the use in the testing-stations of the new form of photometer and the Harcourt 10-candle pentane lamp. As readers are aware, the source of light in this lamp is the flame produced by burning, under definitely prescribed conditions, a stream of air carburetted by pentane, which is prepared by fractionating light American petroleum, and purifying the portion which distils over at 45°. It is the high specific gravity of the pentane itself which is used to start and maintain a

syphoning action which ensures the constant feeding of the burner of the lamp with a mixture of air and pentane vapour. Means of control and adjustment are provided so as to bring the lamp under constant conditions. All these will be found fully explained in the text of the lecture.

Then in regard to the table photometer, Dr. Clowes' description showed that, as in the old form of photometer, the principle adopted is the bringing to equality the illumination of a translucent screen by the standard flame and the gas-flame under examination; but in this case both flames are on one side of the screen and the observer is on the other. Another essential difference is that both sources of light are fixed in position at accurately measured distances from the observing-screen. The equating of the illumination of the screen is brought about by adjusting the supply of the gas which is being tested to the Sugg London argand burner. The equipment of the photometer was described; and it will be observed that, by the use of black velvet screens, and painting the table top and all pieces of apparatus upon it a dead black, it is not necessary to employ a completely darkened room. The aërorthometer for quickly correcting the gas volume for the temperature and pressure of the air was described, as was also the $\frac{1}{10}$ cubic foot measure, by which the accuracy of the photometer meter can be tested.

This brought the lecturer to the point at which he was able to introduce the portable photometer. The table photometer, he says, requires little modification in order to adapt it to be conveyed on a cab to points in different parts of the Metropolitan gas districts outside the fixed stations; and so —but Dr. Clowes omitted to say this—outside the prescribed conditions for testing. However, as he told his hearers the London County Council have undertaken tests in this way. The whole of the apparatus is fitted into travelling cases; and at the place where the gas is to be tested, a flexible metal tube serves as a connection between the photometer and the source of supply. In the Doctor's opinion, the experience of the use of the portable photometer entitles it to be recommended as a satisfactory and trustworthy means of ascertaining the illuminating value of the gas "which is being supplied to the room in which the test is actually made." Curves were exhibited by the lecturer to show in juxtaposition the results obtained during six months by the portable and fixed photometers. But the records for the former are not continuous. At the testing-stations the gas was shown to have been uniformly above 16 candles. By the portable photometer, it was found to be, in the case of one Company, "at least equally satisfactory in illuminating power;" but in the case of the other two Companies, the tests showed "a lower illuminating power than the gas supplied to the fixed testing-stations." It is hard to believe that Dr. Clowes would write or say anything but what he honestly believes; it is equally hard for us to believe that he can suspect the faithful adherence of the Gas Companies to their duty in this matter of the quality of the gas supplied to their customers. But what other construction can be put upon one sentence of which he made use? "It appears," he said, "to be possible to maintain a supply of gas of satisfactory quality to the fixed testing-stations while the consumers in the district around these stations are receiving gas of less satisfactory illuminating power." In definiteness that statement, so far as we recollect, exceeds any admission made by the Doctor on the subject when the Portable Photometer Bill was before the House of Commons Committee in 1900.

The lecturer had present two completely fitted table photometers and pentane lamps, separate examples of the accessories, and some interesting diagrams. He illustrated the great specific gravity of the pentane vapour by pouring it (invisible as it is) from glass vessels just like water, and then firing it on the bench before the President and in glass dishes. Dr. Clowes' assistants—Mr. Grimwood and Mr. Priest—gave demonstrations of the use of the table photometers at the close of the sitting. But they found it impossible to take actual readings, owing to the fact that the compressed gas contained in the bottles they had with them for the purpose was discovered as being of only 10-candle power; and the photometer does not read as low as this. As there is no gas supply in the building, the difficulty could not, unfortunately, be overcome.

Carburetted Water Gas.

The remainder of the sitting was profitably taken up by the reading and discussion of two papers on the above subject. Mr. William Langford, of Longton, in the first informed his fellow members why he adopted water gas; and, in the second, Mr. Robert Porter, of Elland, made a remarkable contribution to the question by endeavouring to prove that, from first to last, on the information available, carburetted water gas is a financial mistake.

Mr. Langford mentioned how an exceptional increase in demand for gas in the second half of 1899 necessitated an immediate extension of his productive capacity, and how after a careful consideration of all the points, he resolved to devote a portion of his old retort-house to the installation of two sets of generating plant, each capable of yielding 300,000 cubic feet per day. In connection therewith, provision was made for duplicate oil and feed pumps, a new boiler-house, Lancashire boilers, a steel storage tank to contain 52,000 gallons of oil, a coke-lift, and a steel separator, 20 ft. by 8 ft. by 6 ft. The plant was supplied by Messrs. Humphreys and Glasgow; it was in operation by November, 1900. The smaller of the two existing holders is used as a relief holder; and into this the gas passes from the generating-house. A return pipe carries it to the exhausters, from whence it travels with the gas. The engines selected are of a high-speed self-lubricating type, working at 550 revolutions per minute. A good and regular supply of dry steam at a pressure of about 100 lbs. per square inch being of the utmost importance for a water-gas plant, the boilers adopted are of sufficient power to provide steam for the whole of the works. In several respects, the author's experience coincides with the general practice; but from among his points, may be noted these: He finds it advisable to have reserve men on the works who can take charge of the operating-floor. He has also observed that the success of the plant depends mainly on the condition of the generator. The general practice is four minutes for blowing and seven minutes for gas making; but Mr. Langford has discovered that, by working at a high blast pressure of 19 or 20 inches, the time of blowing can be reduced to three minutes, and the daily output per set thus materially increased, without sacrificing efficiency. No advantage, however, is gained in prolonging the time of gas making beyond seven minutes. As a check on the duration of runs and blows and the time taken in clinkering, he has found a cycle recorder fixed to the outlet of the generator a great advantage in giving a diagram for 24 hours' working. As the average of a series of tests of his production of water gas, he gives the following figures: Illuminating power, 19·15 candles; oil per 1000 cubic feet, 2·52 gallons; carbonic acid 3·21 per cent.; candles per gallon, 7·59; and coke used in the generator 35·8 lbs. Taking the cost of oil at $4\frac{3}{4}$d. per gallon, coke (including 10 lbs. for boilers) at 9d. per cwt., and wages, he finds the net cost of unpurified gas would be about 1s. 4d. per 1000 cubic feet. Since adopting the plant, naphthalene troubles have been less frequent; and he was able to close the works for twelve hours each Sunday during last winter. By making the water-gas plant bear the brunt of all emergencies in the demand for gas, he finds the life of the coal-gas retorts is lengthened; and the work in the retort-house is much more regular. The author has no doubt that the manufacture of coal gas would be found the cheaper; but there are indirect advantages, with the water-gas plant as an auxiliary to the retort-house, which cannot be well expressed in money value.

Mr. Porter's contribution to the subject was of a type which is rarely met with at technical gas meetings. It was highly contentious in matter and form; and it was delivered in such a measured and almost defiant tone that the members hardly knew whether to take their old friend seriously or humorously. However, it is sufficient for us that the paper produced an informative discussion, and that was what Mr. Porter had worked for. Even then it did not go to the depth that he had hoped for. The foundation of the paper is the Parliamentary Returns of 1900, from which he ascertains that water-gas plant of over 100 million maximum day's capacity produces 10,067,306,210 cubic feet out of a total manufacture of 147,155,557,421 cubic feet, or 6·84 per cent. of the whole. In a tabular statement, the total daily make of 48 plants is given as 104,045,000 cubic feet; the yearly make as mentioned above; the oil used as 33,108,804 gallons (or 3·28 gallons per 1000 cubic feet of gas); and the average percentage efficiency obtained as 48·37. The figure given as to the quantity of coke used is 19,510 tons; but this only applies to seven undertakings. In these cases, the coke used averages 55·23 lbs. The small annual make per unit of daily capacity of plant he refers to as a striking feature. Taking the maximum day's capacity of the plant used at 104,045,000 cubic feet, and applying

the coal gas multiplier of 200 days, an annual make of 20,809,000,000 cubic feet should be shown; whereas the returns actually disclose a total annual make of only 10,067,306,210 cubic feet, or merely 48·37 per cent. of that evidently anticipated by those who adopted its use. Speaking from observation, he thinks the introduction of water gas has had little, if any, effect in reducing holder capacity. Excluding the gasholder, he sets out the costs of a nominal million cubic feet coal-gas plant; and they total to £28,600. At current prices, a fully equipped water-gas plant of equal capacity would cost £15,000, which shows an increased cost for the coal-gas plant of 47·55 per cent. But seeing that the maximum day's capacity of the water-gas plant yields only 48·37 per cent. of the annual duty obtainable from the coal-gas plant, the nominal cost of the water-gas plant must be multiplied by 2·0674, which gives £31,010, as against £28,600 for the coal-gas plant. Possibly, he admits, something is gained in ground space; and he regards as creditable the average consumption of 3·28 gallons of oil per 1000 cubic feet. On the other hand, a coke consumption averaging 55·23 lbs. is most unsatisfactory, compared with the 45 lbs. (inclusive of boiler fuel) usually claimed. The conditions of supply in this country appear, in the author's view, to minimize the emergency quality, of which so much has been made. He agrees that water-gas plant keeps a certain quantity of coke off the market; but not necessarily at a time most suited to control prices. From his statements and deductions, he has compiled two estimates of the cost of carburetted water-gas manufacture—the first representing the claims made in the earlier stages of the manufacture, and the second the cost in actual practice to-day. In the first case, the total is 13·15d. per 1000 cubic feet, and in the second 21·30d., or a difference of 8·15d., or 61·21 per cent. Conceding that water-gas manufacture will continue to increase a little further, in the author's opinion 10 per cent. is the full proportion to which it will attain; and then there will be a gradual decline until high illuminating power gives way before low-grade gas.

The clear statement of facts tendered by Mr. Langford did not evoke much criticism during the discussion; nearly all the speakers—the majority of whom were water gas men—turning on their experience to combat Mr. Porter's contentions. Some members did not think that gentleman had really been serious in all he said; and one went so far as to assert that he thought the author was romancing. Several considered that want of practical experience accounted for the line of argument adopted in the paper. The strongest onslaught came from Mr. Stelfox. Among his points, he stated that he has sent out nearly 60 per cent. of carburetted water gas; and he has been able by the aid of his plant to take an amount of excess which no reasonable amount of storage capacity could have dealt with. He ridiculed the manner in which Mr. Porter had made use of the "percentage of efficiency obtained," on the ground that the plant was not fully or constantly in use. A point often lost sight of in making comparisons is that coal gas is generally of about 15-candle power; while the water gas is from 21 to 22 candles. His use of oil last year was just about 2·77 gallons per 1000 cubic feet. The author took 4d. per gallon as the price of oil; but this, said Mr. Stelfox, is not fair, unless comparison is made with the recent high price of coal. For his last parcel of oil, he (Mr. Stelfox) paid 4¾d. per gallon. Having looked into Mr. Porter's figures as to the coke used, he found in the seven towns to which reference is made, that it ranges from 41 lbs. to 87 lbs.—the average being 55·23 lbs. He held that it is unfair to apply this average to the whole country; seeing that the variation in these seven cases is so great. At Belfast it is found that 41 lbs. suffice, although spare plant is always kept waiting to take up emergencies. Mr. Stelfox gave figures showing that his results exceed the makers' guarantees. Even after seven or eight years' experience, he is more satisfied with his working every day. From a statement by Mr. J. P. Leather, it is clear that the advantages he anticipated before adopting carburetted water gas have been more than realized. He based his original calculations on oil at 3½d. per gallon; but although he has paid nearly 5d. for it, there has been a saving on what would have had to be spent on cannel. In regard to working costs, the author stated that oil was generally taken at 7 candles per gallon; but in Mr. Leather's 24-hour tests, he has got up to considerably over 8 candles per gallon. His oil consumption is 2·8 gallons per 1000 cubic feet of 20-candle gas. His plant has a capacity of 1½ million cubic feet per day; but he makes 1,200,000 cubic feet in one set, which was guaranteed at 750,000 cubic feet. But the fact that he only makes the quantity stated has nothing to do with the "percentage efficiency;" it simply means that he is ahead of his requirements. Previous to putting down the plant, out of his make of 21,000 tons of coke, Mr. Leather had to sell 3000 to 4000 tons to an outside customer; but he is now able to dispose of all his available production in the borough at a higher price. He has recently bought 1000 tons of oil at 4d. per gallon.

A preference for calling carburetted water gas by the name of "oil gas" was confessed to by Mr. C. S. Ellery. He has been making an experiment as to the stratification of water-gas in a gasholder; and it proves to him that there is no great difference in the gas at any part. The figures given by the author, Mr. Ellery says, show that the amount of carburetted water gas made in this country is not an insignificant one; and they also prove, supposing Mr. Porter to be right, that a number of gas engineers have "gone wrong." Like Mr. Leather, he has looked ahead in providing his water-gas plant; but every year will bring him nearer the maximum efficiency. In his case, they have been able to stave off an expenditure of £20,000 on a gasholder by the outlay of £10,000 on water-gas plant. It is not that they can store a million cubic feet; but they can readily make and supply a million. He finds it a great benefit to be able to control, by means of his plant, the coke market in his district. The paper by Mr. Porter has the sympathy of Mr. Isaac Carr, who referred to the evidence he tendered to the Home Office Committee on carburetted water-gas. Whatever advantage there may be in water gas, he claims that economy is not one; and he fails to see where the process is going to benefit the consumer. He asked whether anyone could show him how he would be able to reduce the costs below his present method of working by introducing water gas. He is afraid, by taking that course, he would have to increase the selling price of the gas. To the plethora of practical experience in favour of water gas, Mr. Henry Green added his. He is tied to 18-candle gas, and he finds that the 21-candle carburetted water gas he makes only costs him ¾d. per 1000 cubic feet over 18-candle coal gas. Previously he had to use a large quantity of cannel to get up to 18-candle gas. Another point he made was that his coke was screened through a ½-inch screen; and formerly a large amount of small breeze had to be thrown away. It is, however, now used under the boilers; but while it apparently increased the consumption of coke per 1000 cubic feet (because the same results cannot be expected from waste breeze as from good coke), it gives him a larger amount of coke for sale than he would otherwise have. About 15s. per ton is now obtained in Preston for coke; while, if the Company had not water-gas plant, they would not get more than 10s. for it. Pointing out that Mr. Porter put the price of carburetted water gas at 21·3d. per 1000 cubic feet, Mr. William Carr threw out the point-blank inquiry, "Now you makers of water-gas, tell us how far he has exceeded the actual cost?" Mr. Stelfox replied, "By 8d." Then, said Mr. Carr, if he is 8d. wrong, give us information as to where, in his items of working costs, he has gone astray. On the point as to the space occupied by water-gas plant, the interesting statement was made by Mr. S. W. Durkin that, on a site that was formerly occupied by a coal-gas plant of 320,000 cubic feet capacity per day, a water-gas plant equal to 1,300,000 cubic feet has been erected. The plant has also effected an improvement in the price of coke. The experience of Mr. John Booth enabled him to say that his cost for carburetted water gas was some pence per 1000 cubic feet less than the 21·3d. given by Mr. Porter. The plant has also saved his Committee a good many thousand pounds for storage accommodation. Mr. R. G. Shadbolt's inquiries have led him to the conclusion that he could not make carburetted water gas at Grantham so cheaply as coal gas; and he spoke in support of the basis adopted by Mr. Porter. Plant for producing about 2½ millions per day has been put down by the President for £17,000; and he does not think coal-gas plant could touch that. The plant, too, has made a difference to them of at least £1000 a year in respect of coke alone. When he has been making a 50 to 60 per cent. mixture, he has never had any complaint. He gave figures which show that he has worked as low as 14·66d. per 1000 cubic feet of 21·53-candle gas. Under a long cheap contract, his oil price is 2⅜d. per gallon. Mr. Langford briefly replied upon the little comment on his paper; and Mr. Porter made some general observations on the criticisms passed on his communication,

complaining that the discussion had not given him much information. He made the confession that he has been anxious to put in water gas, and that is why he has been looking up these figures. He regrets that more makers of carburetted water gas do not give their coke figures in the Board of Trade returns.

Mr. Porter has the consolation of knowing that his paper produced an admirable discussion. But the figures derived from the practical experience of Messrs. Stelfox, Leather, Ellery, Green, Durkin, and Booth, and the President are likely to give a fillip to carburetted water gas manufacture in this country, which was not exactly the intention of the author in writing his paper.

With this discussion ended the second sitting; and by ten o'clock on Thursday morning, the members were prepared to commence the third and last day's technical work. The first matter to be brought before them was the apparently interminable one of

Interchangeable Meter-Unions.

It was introduced in a communication from Mr. R. S. Carlow, the Secretary of the North British Association, in which he stated that, in conjunction with the meter makers, a series of unions had been agreed upon for Scotland; but in view of the fact that Mr. J. Ferguson Bell's paper before the Midland Association had evidently stimulated interest in the matter, it was thought that another effort might be made to obtain uniformity throughout the country. Contrary to expectation, there was considerable discussion, headed by a motion by Mr. W. Hardie expressing the approval of the Institute with the action taken by the North British Association. As the debate proceeded, the view was opened up that the passing of the resolution would somewhat tie the hands of the Institute; and, in the result, the Council were asked to appoint a Committee to deal with the question—Mr. W. W. Hutchinson making the business-like suggestions that it should be taken in hand quickly, so that a report might be brought before the Glasgow conference in September, and that the Council should put themselves in communication with the Institution of Gas Engineers on the subject.

Incandescent Gas Lighting.

The members then settled down to the consideration of the three remaining papers on the *agenda*. Being on kindred subjects, they were taken together. Mr. William Sugg, the senior of the authors in years and in work for the gas profession, led off; and his reception was a cordial one. He gave to his paper the title "High and Low Pressure Gas Incandescent Lighting." The second contribution was from the pen of Mr. C. Scott Snell, dealing with the "Self-Intensifying of Gas Pressure by Means of Waste Heat." Unfortunately, a visit by Mr. Snell to America clashed with the meeting, so that Mr. C. W. Phillips was called upon to represent his absent colleague. The third paper was by Mr. Walter Grafton, of Beckton, the popular instructor of the Polytechnic Gas Manufacture classes. "The Effect of Quality and Pressure of Gas on the Efficiency of Incandescent Gas Lighting, having regard to Economy," was the title of his communication, which was the most polemic of the three.

Touching upon the well-merited contemptuous remarks which have lately been made on the street lighting of the Metropolis, Mr. Sugg, quoting from Mr. Corbet Woodall's address to the Southern Association, pointed out that those interested in our public affairs cannot be ignorant of the possibilities of gas; for here and there in London streets are examples of splendid gas lighting—notably the 1000-candle power high-pressure lamps in the crossway of the Strand at Wellington Street. It is interesting to learn that the stronger mantles now made for high-pressure lighting are much superior in light-giving power and durability to those which were supplied at the inception of this system of lighting. In connection with such lamps, where there is great vibration, the author urges the importance of using an anti-vibrator. On the question of burners, it is noted by him that, exactly as with the old standard London argand burners, in order to obtain the highest duty per cubic foot of gas consumed, the pressure at the point of ignition must be very low; and he supplies figures as to the velocity of the gas, the pressure at the point of ignition, and the duty obtained by various burners of his own invention. In passing, he alludes to the remarkable fact that the London argand gives 3·2 candles only per cubic foot of gas consumed, or one-tenth the amount of light which the gas can yield when burnt in a high-pressure burner. The paper will have to be read attentively so as not to miss some of the ideas which the author has promiscuously sandwiched between other matter. Take, for instance, the following: "The quantity of air supplied into the interior of the mantle with the gas is not sufficient to produce perfect combustion; but the mixed gas and air burning under the mantle exercises a very powerful attraction on the oxygen of the surrounding atmosphere, and causes it to part company with the nitrogen, with which it is only mechanically combined, and diffusing itself through the meshes of the mantle, meets the heated mixed gas, and combining with it on the surface of the mantle produces a very brilliant white light, very similar to the oxy-hydrogen lime light." Then the author reverts to the question of velocity, and gives further figures, from which it is apparent that, with incandescent burners, the velocity with which the gas issues from the jet at the base of the burner is a very important factor in obtaining high results. It is also clear that a much increased velocity of the gas issuing from the top of the burner is of no less importance, but this velocity must be without appreciable pressure. From his large store of knowledge, the author, in the concluding part of the paper, made plain how great has been the march of progress in the lighting duty obtained from gas during the last thirty years or so. From about 1 candle per cubic foot of gas consumed with the old fishtail and batswing burners to 32 candles per cubic foot now obtainable, is truly nothing short of marvellous.

There is a little delicacy about the contribution of Mr. Scott-Snell which we do not hesitate to point out. It is this, that although from the beginning to the end of the paper, he is dealing with the ingenious self-intensifying incandescent gas-lamp which is the fruit of his own study, the name of "Scott-Snell" is entirely absent. This invention is not by any means a haphazard one. It is the issue of first a recognition of the necessity of attaining an object—in this case, the attainment of high pressure in a gas-lamp itself—and then, by carefully following out a line of reasoning, and studying each detail with minuteness, ultimately arriving at realization. Perhaps few know better than the writer the care that Mr. Scott-Snell has devoted to the perfecting of his lamp—embracing certain vigils in testing the efficiency and action of the parts during constant running. With the general principle of the lamp our readers are acquainted. The considerations which actuated him in constructing it are communicated for the first time in the paper; and for the duty of each part, and for the cycle of actions which occur in compressing the gas, there is a scientific reason given. In short, the author in his paper lifts the curtain in order that the gas profession may see behind what he has hitherto presented to them—viz., only the completed lamp. However carefully made, no abstract would convey everything that Mr. Scott-Snell has to tell. Readers all know that the intensifying is accomplished in the head of the lamp by the utilization of the waste heat from the incandescent mantle; and the most recent improvements were described in our article on the Glasgow Exhibition a short while since. Readers will be pleased to learn that the little difficulty occasionally experienced in starting the lamp has been overcome; and should the lamp stop its action from any cause, and the supply of high-pressure gas cease, the lamp will automatically adjust itself to the low-pressure supply. A point which the author desires shall not be overlooked is that in burning heated gas the nipple area requires adjustment. For instance, gas when burning at 250° Fahr. will be expanded probably 30 per cent. over its original bulk when it was admitted to the lamp. The nipples therefore require slight enlargement over cold-gas nipples. This admits of greater velocity of delivery; and therefore a sharper blast for drawing air into the burner. The process of maintaining a water-charged head to the lamps has been simplified; and, this being so, the author has preferred to rearrange the lamp more with a view to getting at every part than in prolonging the intervals of water filling. As evidence of the extent of improvement effected in gas lighting devices, it is of interest to note that the step up from a 15-candle power batswing burner giving 3 candles per foot, to a self-intensifying lamp giving 540 candles from a single burner, is as follows: The efficiency is increased twelve times; the unit of light is increased 36 times. These results are of some significance in the competition with electricity. Expressed in other words, it may be said that gas enters the lamp having a value of 2s. 6d. per 1000 cubic feet; but

the light attained gives such service that it is equivalent to reducing the price of gas to 2½d. per 1000 cubic feet. Of course, there is nothing even now (beyond inconvenient size of mantle) to prevent a much larger unit of light being attained. In fact, the author expects to get shortly a unit of 1000-candle power without very material changes in the mantle dimensions.

The paper by Mr. Grafton is essentially one for careful study. In the introductory paragraphs, he deals with the question of raising the pressure of gas, and soon makes it known that his view is that the simplest way is to increase the pressure at the outlet of the works. He fails to see any great difference between a main carrying gas under 15 inches pressure for supplying low-pressure burners, and one carrying a volume of gas under 3 inches to feed intensifiers which augment the pressure to 15 inches at the burners. Of the two methods, he believes that the former will yield the most economical and satisfactory service to the public. Passing on, the author states that quality of gas has really very little to do with augmenting or diminishing economical effect in incandescent gas lighting, providing a proper quantity of air is supplied to bring about a unit mixture of gas and air before reaching the point of combustion. Atmospheric air is another factor, and has by far the greatest influence upon the result. The author does not uphold the intensified incandescent system; and, in his view, it is only superior to the present low-pressure system because, in the case of the latter, the gas issues at too feeble a pressure to induct the proper volume of air at the bunsen tube to ensure rapid combustion, and so protracted combustion follows. One of the factors determining the temperature of the air-gas flame is the degree of the intermixture of the gas and air. By the method proposed by the author, instead of mixing air with the combustible gas after it has been supplied to the burner, he adds air to it before it arrives at the burner. This, he says, may be done either at the gas-works (before or after storage, but before distribution) or in the service main or pipe at or near the place of consumption. It would not, however, be advisable, except in particular cases, with special precautions, to add to the gas all the air necessary for complete combustion before it is supplied to the burner, lest an explosive mixture be formed in the service main or pipe. The author prefers, therefore, to use air-gas burners of the ordinary type, and to add only a portion of the air necessary for complete combustion before the gas is supplied to the burner—leaving the burner itself to suck in the rest through the ordinary intakes, which may have to be regulated. This method, he says, is particularly applicable for incandescent lighting; and he finds, with ordinary burners—such as the Welsbach "C" or Kern burner—he obtains greatly increased candle power with a diminished consumption of combustible gas, by adding to the gas, before it is supplied to the burner, air to the extent of from 5 to 30 per cent. of the volume of the gas. The author's plan is to introduce into the service-pipe, on the consumer's side of the meter, a T-piece, one branch of which is connected with a holder containing air under pressure slightly greater than that in the service-pipe. From this holder, air is admitted into the pipe at a rate regulated by a stopcock according to the quality of the gas supplied, and the amount of reduction thought necessary. Any pump may be substituted for the holder. Low-quality gas made in this way is more effective than by any other known process. The author believes that the sooner the standard of quality is reduced the better for the public and the gas companies; but he does not recommend going below 10 candles.

The discussion on the papers was full of interest. Ever ready in debate, Mr. R. G. Shadbolt came equipped with the results of experiments of his own making. Before. however, entering upon the main part of his masterly contribution, he paid a tribute to the Scott-Snell intensifying lamp. He has had one running about three months, and the number of mantles used has been equal to about ten a year, or double the number required in the ordinary lamps. Considering the amount of vibration, this is regarded by Mr. Shadbolt as very good. The light too is also satisfactory. There has been no difficulty except as to starting; and this, it is understood, has now been overcome to some extent. It was soon apparent that Mr. Shadbolt had been working on similar lines to Mr. Grafton, on whose figures and statements he had much to say. In his own experiments, he put to himself this inquiry, Why not, if it is necessary to use pressure to obtain an intensifying effect, deal with the air, and take the gas at the pressure at which it is distributed He therefore reversed the usual order of things, by using an air-jet instead of a gas-jet, and introducing the gas in at the side air-holes, instead of the air itself. He used two 6-inch burners of the injector type—one of which he modified so as to accord with his idea the other being an ordinary burner. Some remarkable results were obtained; but in this summary they cannot be set out in detail. They will, however, appear in the full report of the discussion next week. In the considerable number of consumers who still use burners other than incandescent, Mr. Thomas Canning sees difficulty to the introduction of low-grade gas. To effect the combustion of the gas at the point of ignition, he says, is the main thing in all incandescent lighting; and the smaller the flame produced by the mixture of gas and air, the greater its intensity. It is intensity that renders mantles luminous—the concentration, so to speak, of the calorific power. Mr. J. H. Sheldrake fears that the question of maintenance will be detrimental in the case of the Scott-Snell lamp; and, in connection with Mr. Grafton's experiments, he points out that, to get the highest efficiency from the Kern burner, the nipple ought to vary according to the quality of the gas. Comments were next passed by Mr. W. H. Y. Webber on certain of the points raised in the discussion and in Mr. Grafton's paper. Among other things, he reminded his hearers that years ago the late Mr. Frank Livesey proved that a great deal of the efficiency of incandescent lighting depended upon proper admixture of air and gas. He tried the simple expedient of mixing air and gas in the rightful proportions in a gasholder, and closing up the air-holes at the bottom of the Welsbach burner; and he got a better lighting effect than could be obtained by any incandescent burner on the market. Mr. Charles Wood thinks that Mr. Grafton, by continuing his experiments, might find that, by improving the burner for a particular gas, he would get much better results than he has obtained under the conditions of the experiments referred to in the paper. Mr. Wood does not think the author used a jet properly proportioned to the mixture employed. In his opinion, the supply of air in gas in any form is outside the range of practical politics. Nearly six months' experience with the Scott-Snell lamp enables him to describe it as a wonderful invention. From some tests he has made with Kern burners, Mr. R. Watson has come to the conclusion that for linear illumination, a small unit of light is the most efficacious for narrow street lighting. Mr. W. W. Hutchinson put questions to the authors, after which Mr. C. E. Jones advocated the supply of gas at high pressure. Mr. Thomas Bower mentioned a curious experience. He has an intensified gas system at his works, some of the lamps being in the engine and boiler house and some outside. Those inside give excellent results; while those outside are an absolute failure. Mr. Vincent Hughes stated that, with some incandescent burners obtained from the Continent, most successful results have been obtained by burning 10 cubic feet of blue water gas per hour. Mr. J. Lyne and the President added a few words; and then Mr. Sugg, Mr. Phillips, and Mr. Grafton contributed further information in reply.

Concluding Business.

Before the sitting ended, a few other matters remained for disposal. The dignity of the Presidentship was conferred or Mr. S. W. Durkin; and Mr. Andrew Dougall and Mr. T. H. Martin are the prospective successors to that distinction. There was quite a formidable extension of the roll of members and associates; in the former class are 24 new comers, and in the latter 16. M. Lébon, the President of the Société Technique du Gaz, was elected an honorary member. An announcement was also made as to the visit of the French Society to England in July. As Honorary Secretary of the Gas Section of the Glasgow Engineering Conference, Mr. J. W. Helps, on the invitation of the President, informed the members as to the position of the arrangements, from which it appears that the promise of technical fare is excellent. Southampton was selected as the place of next year's meeting.

Recreation followed work; Friday being given up to a visit to Herne Bay. The trip was made in the *Clacton Belle* by a party numbering about 150. On arriving at Herne Bay, luncheon was served in the Pier Pavilion. Among those present were noticed Mr. W. A. Surridge and Mr. C. V. Bennett, the Chairman and Manager of the local Gas Company. During the day the weather was somewhat threatening overhead; but nevertheless the excursion was much enjoyed, and formed a delightful conclusion to the thirty-eighth meeting, which has left behind it memories of both regret and pleasure.

GENERAL REPORT.

The Thirty-eighth Annual General Meeting of the Institute was held on Tuesday, Wednesday, and Thursday last week, in the hall of the Royal United Service Institution, Whitehall—Mr. T. Ormiston Paterson, M.Inst.C.E., of Birkenhead, in the chair. There was a good attendance of members.

The Institute and the Royal Family.

The President opened the business by proposing the following resolution: "That the members of the Incorporated Gas Institute, in general meeting assembled, desire to place on record the expression of their deep sorrow at the death of the universally beloved and revered Queen Victoria, from whom engineering science in all its branches received such encouragement throughout her illustrious and beneficent reign. The Institute respectfully tenders to His Majesty the King, and to the other members of the Royal Family, the assurance of condolence in their bereavement, and would offer to His Majesty loyal and dutiful congratulations on His Majesty's accession to the Throne." He said he would ask members to vote on this resolution by rising in their places.

The request was at once complied with.

Confirmation of Minutes.

On the motion of Mr. W. D. Child (Romford), seconded by Mr. W. A. Valon (Ramsgate), the minutes of the last meeting were taken as read.

Appointment of Scrutineers.

Messrs. S. S. Mellor (Northwich) and Mr. F. Clark (Southend) were appointed Scrutineers of the ballot papers.

The Report and Accounts.

The annual report, which had been circulated among the members, and the chief features of which were noticed in the "Journal" for the 28th ult., was taken as read, and, on the motion of Mr. E. H. Stevenson (London), seconded by Mr. W. A. Padfield (Exeter), unanimously adopted.

Mr. J. West (Manchester) next moved that the statement of accounts be approved. He said he was very pleased to find the accounts in so healthy a condition, especially looking back to the time, some seven years ago, when he had the honour of being President, when the expenses exceeded the income by about £104, and there were outstanding liabilities to the extent of something like £400. During the intervening period, this amount had been paid off, and the balance on the right side of the account had been increased to between £500 and £600. As one of the Trustees, he would suggest that a little more money might be invested, so as to bring in more interest.

Mr. J. Hepworth (Edinburgh) seconded the motion, which was carried unanimously.

Awards of Premiums.

The President next announced the award by the Council of the following premiums for papers read at last year's meeting:—

First Prize (£10 and the President's Medal).—To Mr. W. R. Chester, of Nottingham, for his paper on "Automatic Stoking and Inclined Retorts."

Second Prize.—To Mr. W. Young, of Peebles, for his paper on "Naphthalene."

Third Prize.—To Mr. A. T. Walmisley, for his paper on "Retort-House Roofs."

Mr. Chester, in receiving the medal, expressed his great gratification at the honour which had been awarded him.

Neither Mr. Young nor Mr. Walmisley was present; but the former had expressed the wish that the cheque awarded to him should be handed over to the Benevolent Fund.

President's Address.

The President then delivered his Inaugural Address, which was given in the "Journal" last week (p. 1558).

Mr. C. Stafford Ellery (Bath), in moving a vote of thanks to the President for his address, said he could not help feeling that the Paterson family had laid the Institute under great obligations. All remembered the venerable Mr. Paterson, of Warrington; not many years since, his son, Mr. Paterson, of Cheltenham, led the Institute through a successful year; and now Mr. Paterson, of Birkenhead, had given them an address for which they would all heartily thank him. It was rather significant that they heard so much nowadays of the calorimeter; and he should be glad if the President would inform them at what point in the works the mixture of gases to which he had referred took place, because the result of some experiments he (Mr. Ellery) had made led him to think that this point was of considerable importance in regard to the effect it produced upon the illuminating power.

The President said the mixture was made in a holder in a room under the testing-room.

Mr. Ellery said he believed it would ultimately be found that still greater advantages would very likely result from mixing the gases in the retorts. They were much indebted to the President for his remarks on this subject, and especially for the tables he had prepared. Some managers were still of opinion that water gas was not economical; but those who adopted it would be much assisted by the information now given them.

Mr. J. Carter (Lincoln) expressed his pleasure in seconding the motion; remarking that he was sure the address would well repay any time and thought spent upon it.

The motion was put by Mr. Ellery, and carried unanimously.

The President, in acknowledging the vote, said if anything in the address proved of service to the members, he should be amply repaid for the trouble he had taken in its preparation.

The Proposed Amalgamation.

The Secretary (Mr. W. T. Dunn) read the report of the Council on the Amalgamation Scheme, as follows:—

The steps taken at and previous to the annual meeting of last year, with the object of promoting the amalgamation of the two Societies, will be found recorded in the Institute "Transactions" for 1900, in connection with the Council's annual report, the President's Address, and in the general discussion of the question by the members, which followed; with the exception of some correspondence which has appeared for the first time in the report on the subject recently presented to the Institution of Gas Engineers. The result of the Institute's consideration of the proposals brought forward at the meeting last year may be summarized thus—

(1) The following resolution was passed unanimously:—

> "That it is desirable that the Incorporated Gas Institute and the Incorporated Institution of Gas Engineers be amalgamated."

(2) The following amendment was lost:—

> "That the liquidation of the Incorporated Gas Institute is not called for in effecting amalgamation with the Incorporated Institution of Gas Engineers; and that it be an instruction to the Council to effect the proposed union without dissolving the Institute."

(3) The following amendment was lost:—

> "The resolution as worded in No. 5 down to 'Memorandum and Articles of Association,' to delete the remainder, and add 'But that the draft Memorandum and Articles of Association now presented do not meet with the approval of the members, and that they be referred back for the further consideration of the Council.'"

(4) The following amendment was lost:—

> "That in clause 4 of the proposed Memorandum of Association, the words 'be or remain' a member of the ..... be deleted, and the words 'Become a member after the date of amalgamation,' be inserted in their place."
>
> Note.—Clause 4 reads "No person shall be qualified to be or remain a member of the ..... who shall be actively engaged in or about the management or business, either as principal managing director of a Joint-Stock Company, or as agent, or traveller, of any trading company, firm, or concern doing business with gas undertakings, whether as vendor or as purchaser."

(5) The following resolution was carried:—

> "That it is desirable that such amalgamation be effected by the voluntary liquidation of the Incorporated Gas Institute, and the Incorporated Institution of Gas Engineers, and by the transfer of all property and assets of these two Societies to a new Society, to be registered under the 23rd section of the Companies Act, 1867, by the name of the Society of Gas Engineers and Managers (incorporated 1900), having a Memorandum and Articles of Association in the form of the draft issued to the members, and produced to and approved by this meeting, and identified by the signature of the Presi-

dent, subject to such alterations (if any) as may be approved by the Council."

(6) The following resolution was lost :—

"That the Institute be wound up voluntarily."

(7) The following resolution was carried unanimously :—

"That as the desirability of the union of the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute was unanimously resolved by the members of the Institute as shown by the voting yesterday, we desire to place on record our appreciation of the labours of the President and Council in endeavouring to bring about the amalgamation, and earnestly request them to continue their efforts to secure a satisfactory agreement, and to call another meeting of the Institute to consider and vote on their proposals at the earliest possible opportunity."

A copy of this resolution was on the same date, June 13, 1900, sent to Mr. J. W. Helps as President of the Institution, and on June 28 the following letter was also addressed to him :—

[*From the Institute.*]

James W. Helps, Esq. *June* 28, 1900.

Dear Sir,—Referring to the resolution passed at our recent annual general meeting, a copy of which was sent you on the 13th inst., the Council have arranged to hold a meeting to discuss the matter on Friday, July 20.

It has occurred to me that it would be a very great advantage if they could then have before them the present views of your Council on the subject; and any proposals which they may consider would conduce to an ultimate realization of amalgamation.

Will you kindly give the suggestion your consideration, and let me have your reply for communicating to our President, Mr. T. O. Paterson, of Birkenhead.

(Signed) WALTER T. DUNN, Secretary.

The reply of the Institution to this letter was as follows :—

[*From the Institution.*]

Walter T. Dunn, Esq. *July* 16, 1900.

Dear Sir,—Your letter addressed to the President of this Institution was read and considered at the meeting of my Council held here on the 7th inst.

I am desired to preface my reply thereto by briefly recapitulating the steps to bring about re-union, in which this Institution took part.

In the first place a Joint Committee constituted of an equal number of both Societies was appointed, with power to discuss and arrange a basis for re-union.

The President of the Gas Institute was elected Chairman of the Committee.

As the result of its deliberations a draft of Articles of Association and rules for a new Society to be formed to take over the assets of both existing ones, was unanimously agreed upon. A copy of the rules so agreed was placed in the hands of every member of this Institution, and at the general meeting held in May last these were unanimously adopted by the members.

Some further modifications were subsequently suggested by your President as likely to be acceptable to your members; and these were fully and carefully considered by my Council, and in the main accepted by them on behalf of this Institution.

My Council have no idea what points are now at issue since the principle of dissolving both bodies to form a new one, with rules acceptable to both, was unanimously agreed upon by the Joint Committee under the chairmanship of your President, and it is understood adopted by the Councils of both Societies.

Under these circumstances my Council have no further suggestion to offer; but, in saying this, I am desired to add that they will be prepared to consider any communication your Council may be pleased to submit upon the matter.

(Signed) THOMAS COLE, Secretary.

Your Council held a meeting on July 20, 1900, to consider the best means of putting into effect the wishes of the members as expressed in their resolution of June 13, and it was resolved to submit to the Council of the Institution the proposal that to clause 4 of the proposed Memorandum of Association these words be added: "But it shall be optional for the Council, with the approval of the members, to re-elect any person, or to elect any person, who belonged to the Incorporated Gas Institute or to the Incorporated Institution of Gas Engineers, who in their opinion has in the past rendered such services to the gas industry as warrants such re-election or election." The Council at the same time expressed the view that, while there were some names on the Institute roll which it would be desirable to exclude from the new Association, there were other names of those who should be connected with it, but who would be debarred if clause 4 were passed as originally framed.

The letter conveying the above resolution was sent to the Institution on July 21, and it should be noted that this resolution was purposely worded in as open a manner as possible—the object being to obtain a common ground upon which negotiations could be continued, and an endeavour could be made to arrive at a settlement agreeable to all. Instead, however, of being able to arrange a meeting, and carrying through the amalgamation in the autumn, as your Council had hoped, no reply was received from the Institution until Oct. 15. In it the request was made that a list of names should be prepared, a proposal which your Council felt they could not comply with. The letters from the Institution on this point, and your Council's resolution passed on the 19th of October with regard thereto, were as follows :—

[*From the Institution.*]

W. T. Dunn, Esq. *Oct.* 15, 1900.

Dear Sir,—Your letter of the 21st of July was laid before my Council at a meeting held on Oct. 10, and was very carefully discussed.

They feel that such an addition to rule 4 as your Council suggest has many objections, and would not meet with the approval of the members. At the same time they quite appreciate the truth of the statement made in the latter part of your letter—viz., "That while there are some names on the Institute roll which it will be desirable to exclude from the new Association, they feel that other names occur of those who should be connected therewith, but who would be debarred if clause 4 were passed as framed originally."

They therefore suggest that as probably there are but few members of this latter description, the two Councils should agree upon the names. My Council therefore suggest that your Council should submit the names of those they would wish to retain with a view of getting over the difficulty by including the names of such gentlemen in the Articles of Association, rather than by providing for their election by a separate clause.

(Signed) THOMAS COLE, Secretary.

[*From the Institute.*]

"That the Council of the Incorporated Gas Institute having carefully considered the suggestion offered by the Council of the Incorporated Institution of Gas Engineers to select the names of those whom it would be desirable to exclude from the proposed new Institution, feel that such a course presents very great difficulties and that it would be inadvisable to adopt it. They believe that the prospects of amalgamation of the two Societies might be much improved if a conference of the respective Councils were to be held, with a view of affording the opportunity of discussing together the remaining questions involved, and desire that the Council of the Incorporated Institution of Gas Engineers may suggest a date, time, and place, where such a meeting may be held, as soon as possible."

[*From the Institution.*]

W. T. Dunn, Esq. *Oct.* 30, 1900.

Dear Sir,—In reference to yours of the 24th inst.

Your resolution refers to the suggestion of my Council, that the Council of the Incorporated Gas Institute "should select the names of those it would be desirable to *exclude from* the proposed new Institution."

"Exclude from" is apparently written in error for "include in," *vide* my letter to you of Oct. 15, last paragraph. "My Council would therefore suggest that your Council should submit the names of those they would wish to *retain*, &c."

(Signed) THOMAS COLE, Secretary.

[*From the Institute.*]

PROPOSED AMALGAMATION.

Thomas Cole, Esq. *Nov.* 3, 1900.

Dear Sir,—In reply to your letter of the 30th ult., I beg to say that the wording of the resolution quoted in my letter of the 24th ult. is correctly given as there stated.

The selection of names of those whom it would be desirable to retain in the proposed new Institution would, of course, involve the selection of those to be excluded; and it is with regard to these latter that my Council foresee great difficulties, if the selection of names in the manner suggested by your Council were attempted.

(Signed) WALTER T. DUNN, Secretary.

Feeling that no progress was being made by the process of correspondence, and that the effect of it seemed to be the reverse of drawing the two bodies together, your Council decided to suggest that a meeting of both Councils should be held, so that views could be freely exchanged, and to see whether amalgamation was desirable or not.

On Jan. 8, 1901, a letter was received from the Institution, conveying the assent of the Council to meet your Council at a conference, which was accordingly held on Feb. 9 at the house of the Institution of Civil Engineers, London, by the kind permission of the Council of that body. Mr. J. W. Helps was appointed Chairman; and your Council were requested to express their views. The principal question at issue, it was felt, was the retention or otherwise of the extraordinary members and associates, or at least

those of them who were associated with trade. This matter your Council had carefully considered at a previous meeting, and they had come to the conclusion that it would be their duty to decidedly recommend the acceptance of the whole of the names as they stood. After fully discussing at the conference the *pros* and *cons* with regard to this, your Council received the impression that the Council of the Institution were at one with them. The questions of dissolution and of name were afterwards introduced, and with reference to them your Council recommended a certain course, which was set forth in their communication to the Institution of the 26th of February (see below); but at the conference your Council stated that if these recommendations did not meet with acceptance by the Council of the Institution, or they could not see their way to advise their members to accept them, that your Council would be willing to forego them. If they considered that the Institute ought to be dissolved, your Council would agree to it—in fact were prepared to yield to the Institution the freest action in the matter, provided the Institute list of names could be adopted in its entirety. The remarks urging the avoidance, if possible, of dissolution and change of name were made by your Council in the belief that such a course would be the best means of bringing about a union, and, it is unnecessary to add, not at all with any idea of insulting or humiliating.

There was no expression of opinion from the Council of the Institution as to what their desires were on the subject, or as to whether they felt disposed to accept any of the suggestions brought before them; but at the close of the conference your Council were asked if they would put their views in writing, so that there should be no misunderstanding when they came to be further discussed. The communication of the 26th of February was accordingly prepared, simply as a digest of the opinions expressed at the conference of Feb. 9. It was never intended as a full and complete statement to be submitted to the members of the Institution of Gas Engineers, or much that was left to the memory of those present at the conference might have been included in that communication, the text of which was as follows:—

[*From the Institute.*]

Feb. 26, 1901.

"Having carefully considered the question with regard to Extraordinary Members and Associates, with a view to seeing how far it is possible or practicable to eliminate some and retain others, we find the difficulty increases the further we go, and after carefully looking through the list, we come to the conclusion that the number is so few whom we should desire to exclude that we think it scarcely worth while to enter into any personal matters for the sake of so small a consideration. Further, having in view the fact that this class of member has reduced so very considerably during the last few years through death and other causes, also through care having been taken by the Council during the last few years in not adding to the number, that they might now be left to a process of natural elimination.

"We strongly urge that you will see your way to recommend your members to accept the list as it stands, feeling that it is the best way out of a very difficult position.

"We will favourably consider any rule that shall make it either impossible for any additions to be made to this list in the future, or that it may be optional for the Council to exercise its judgment in the selection of such men whom they may feel are likely to be of service to the Institute, or otherwise, as you think best. This our Council feel is the only way of getting over the difficulty, and we earnestly trust it will commend itself to you.

"Touching the matter of dissolution, we feel very strongly that a dissolution of the Gas Institute is not expedient or wise; and on this point we urge very strongly that you give the matter your most favourable consideration, for the following reasons.

"In the first place we like the name the 'Gas Institute;' we think it is most appropriate, most fitting in every way, and cannot be changed for a more suitable name that will cover the whole body of gas engineers, when once they are united.

"We also believe it will save very considerable trouble in the matter of bringing together the two bodies. Further, that there will be a considerable saving in the matter of expense and time. We shall not require any legal assistance to enable us to draw up a new constitution. The matter of sentiment of course must enter into all these considerations more or less, and we acknowledge that we have a strong sentimental feeling with regard to the preservation of a body that has existed for so many years; and therefore we would like you, if you can possibly see your way, to urge upon your members the desirability of preserving the 'Gas Institute.'

"We would suggest as a simple means of bringing about the amalgamation that the whole of your members should be transferred without the formality of an election, that you should nominate six of your members to be added to our Council, and that you should nominate the President for the coming year, and the Junior Vice-President, who should succeed Mr. Dougall; or any other better proposal that you may suggest.

"As to the alteration of rules, in order to comply with your wishes as far as may be, after due notice has been given, they can be passed at the next general meeting."

On leaving the conference of the 9th of February, your Council felt that amalgamation was practically *fait accompli*; that it only remained for the Council of the Institution to say to what extent the suggestions put before them could be accepted. From the cordial manner in which they had been received, and the whole matter discussed, your Council entertained the hope that some satisfactory arrangement would be arrived at. It was therefore with surprise that they received on the 1st of April the intimation (see below) that as the communication of the 26th of February raised new issues, the Council of the Institution would require to ask for fresh instructions from their members at the general meeting in May. This action your Council regarded as simply deferring the possibility of unity for another year. However, had the Council of the Institution decided on any particular course, and recommended it to their members, there would still have been time to arrange for the amalgamation at the present meeting. Unfortunately the communication of Feb. 26 was submitted to the members of the Institution as though it were an ultimatum from the Institute; and thus a wrong impression was conveyed of your Council's attitude towards them.

Throughout the discussion of the question by the members of the Institution, the dissolution on the part of the Institute was insisted upon as an indispensable condition to coalition. But this condition your Council had, at the conference, already agreed to arrange, if so desired; and it is certainly a matter for regret that the members of the Institution were not informed of it when they were considering the report on the amalgamation scheme at their annual meeting. The reply of the Institution Council to the communication of Feb. 26 was—

[*From the Institution.*]

PROPOSED AMALGAMATION.

Walter T. Dunn, Esq. *April* 1, 1901.

Dear Sir,—I have to inform you that your letter of Feb. 26, conveying the expression of the views of your Council with reference to the above, was read and considered at a meeting of my Council on the 30th ult.

I have to state that, inasmuch as your communication raises new issues, my Council consider it advisable that they should lay before their members a report summarizing the whole of the amalgamation proceedings from their commencement down to the present time, and to take their instructions thereon.

Arrangements will accordingly be made that this shall be done at the general meeting in May.

(Signed) THOMAS COLE, Secretary.

The report referred to in the above letter was prepared by Mr. Helps, and laid before the members of the Institution at their general meeting held on May 1. The result of the discussion upon it was that the following resolution was unanimously passed by them. It was transmitted to the Institute on the same day:—

[*From the Institution.*]

"That the members of the Institution of Gas Engineers approve of the action of the Council during the negotiations for amalgamation with the Gas Institute, and much regret their inability to accept the proposals of the Council of the Gas Institute as contained in their letter dated Feb. 26, 1901."

On May 4 the Council of the Institute held a meeting to further consider the subject, when the following letter was directed to be addressed to the Institution:—

[Here follows the letter that was given in the "JOURNAL" for May 7, p. 1204.]

In reply to the above, the following letters were received from the Institution on the 29th of May:—

[Here follow the letter already given, *ante* p. 1501, and a formal intimation that the letter had been sent for publication.]

Your Council specially met again on May 31; and, after discussing the suggestion contained in the foregoing letter, directed that the following reply should be returned to the Institution:—

[*From the Institute.*]

PROPOSED AMALGAMATION.

Thomas Cole, Esq. *May* 31, 1901.

Dear Sir,—In reply to your letter of the 29th inst., which has received the careful attention of the Council here to-day, they desire me to say that they will be quite willing to consider for election to the proposed new Society, as Honorary Members, the names of those gentlemen who have rendered distinguished service to the

gas industry; and I am to ask that your Council will kindly mark on the enclosed Institute list (and return as soon as possible) the names of those whom they consider suitable for such distinction, with a view of meeting the difficulty with regard to the exclusion from the proposed new Association of certain members of the Institute who would be ineligible under the new rules.

My Council wish, however, that in addition to those gentlemen ho have previously occupied the presidential chair of the Institute being elected as Honorary Members of the proposed new Society, that all the existing Honorary Members of the Institute should in like manner be received as Honorary Members of it.

(Signed) WALTER T. DUNN, Secretary.

Your Council feel that it only remains for them to submit this report of their action during the past year to the members, and to obtain the expression of their desires as to the nature of any further steps they may wish to have taken in the matter.

The SECRETARY also read the following letter, dated June 10, which had been received the previous evening from the Secretary of the Institution of Gas Engineers:—

W. T. Dunn, Esq. *June* 10, 1901.

Dear Sir,—I beg to acknowledge receipt of your letter of the 31st ult., and, in reply, I am requested to state that my Council are prepared to accept the suggestion of your Council to the effect that, in addition to the election as honorary members of all Past-Presidents of the two bodies, the existing honorary members of the Gas Institute shall also become honorary members of the united Association.

They also wish to point out that, among the Associates, Professor Vivian Lewes, not being a trader, would be eligible for membership of the new body. My Council are also willing to add to clause 7 of the proposed Articles of Association the words "or who have rendered distinguished service to the gas industry."

I am also requested to point out that there is evidently a misapprehension with regard to the statement contained on page 6 of your Council's report on the subject of the retention of traders, "your Council received the impression that the Council of the Institution were at one with them." I may point out that the statement is contradicted by the words contained in the paragraph on page 7—*e.g.*, "There was no expression of opinion from the Council of the Institution as to what their desires were on the subject, or as to whether they felt disposed to *accept any of the suggestions* brought before them."

The question of the admission of traders has always been considered by my Council as involving a fundamental principle; and it is absolutely certain that nothing was said by the members of the Institution Council at the conference that could have led the Council of the Gas Institute to arrive at the conclusion referred to.

(Signed) THOMAS COLE, Secretary.

Mr. CARTER rose, at the request of the President, to move a resolution. He said he would have much preferred to sit quietly and hear the expression of the views of more experienced members upon this matter, but they would all agree that, after the long and sometimes tedious negotiations between the two bodies concerned, they had now arrived at perhaps the most important and most epoch-making moment. What they now did would determine the question, not only for this year, but in all probability for many years to come. The position was all the more serious when they remembered that any failure of duty now would not leave them just as they were—assuming the negotiations failed—but would leave them with a wider chasm, and with the probability of amalgamation more remote than it was before any attempts were made to effect it. Considerations of this character should lead them all to give the matter serious thought, and to carefully weigh every word they should utter, in order that the subject might be approached in the best possible spirit, in the hope of giving it the best chance of ultimate success. The two questions of whether or not the Associations should be dissolved, and what should be the name selected for the new body, were probably never worth the time, the thought, and the care which the two Councils had given to them. They would all admit that these two questions, together or separately, never presented any real difficulty in the way of the solution of the problem which had occupied so much attention during the past two years. If agreement were possible on the larger question of amalgamation, whether they should dissolve or not was merely a miserable matter of form, which they would not allow to disturb their mind for a moment. With regard to what the name of the new Association should be, they had classical authority for asking, "What's in a name?" It did appear that the members of their own Council and the Council of the Institution had been engaged in a spirit of worthy emulation as to which should show the greatest disregard of what the name might be if and when the amalgamation was completed. They had both expressed their view that the name was a thing of absolutely no importance. But there was this further expression, by men of eminence in the Institution as well as in their own body, that perhaps "The Gas Institute" was the most suitable name to retain after the process of amalgamation had been completed. At any rate, these two matters might be put aside. As they all knew, the critical question throughout the whole course of the dispute was that of traders; and one consideration which had occurred to him during the last day or two was that the Institute, as it at present existed, was at any rate not primarily responsible for the difficulty with which it was confronted. Those who were present at a meeting, which had left very lively memories behind it, in a Midland town some seventeen or eighteen years ago, would remember that a very considerable addition was made to the roll of the associate members; and a great number of gentlemen whose connection with the gas industry was of a more or less commercial character—and they were not less honoured on this account—were admitted. They should not forget that the policy which guided the action of the Institute in that particular year was dominated by many of the gentlemen who now occupied a prominent position in the Institution, and who were foremost in advancing their objections to this particular class of member, for whom they were largely responsible. He was not concerned for the moment to argue whether it was a mistake to open the door so widely as was done at that particular meeting, or in previous or subsequent years; but he should be prepared to discuss the question if it arose, and if time permitted. It might be a matter to be viewed with regret or to be regarded with satisfaction. However, what he said was that while the gentlemen who had been prominent in the discussion of this matter in connection with the Institute meetings had a perfect right to say that subsequent observation had convinced them that it was a mistake—and those who held that honest opinion were entitled to their entire respect—still the point he wished to put was that the very fact of the Institute having been left with this difficulty on its hands should cause members of the Institution to deal with the question in a less harsh and severe spirit than they had displayed. It did seem, after all, that there was something to be said for the claim of the Council to retain the honorary and the associate members lists as they were. Many gentlemen on those lists were interested in gas more from a technical than from a commercial point of view; while there were others whose interests were about equal. Looking down the lists, one might see the names of gentlemen who had rendered very conspicuous service to the gas industry—some in relation to the construction of plant; others, in making gas an actual necessity in civilized life, and widely extending the range of its use; others, again, who had done much to bring about that happy condition of things indicated in the President's Address, which had given a very large increase in day consumption, particularly in the summer. They were not to be told that gentlemen whose services to the industry were to be described in this way were unfitted for membership in an association whose only object was to promote the interests of that industry. If this was to be asserted, all he could say was that the conclusion arrived at must be by some process of reasoning utterly beyond his comprehension. Frankness and candour were never so necessary in dealing with this question as they were at the present moment. In the attitude assumed by the Institute, there was as much principle involved as in that honestly adopted by the Institution; and here they came face to face with the real difficulty. The question they had to determine that morning was whether or not amalgamation was to be brought about. They would much prefer—and they had a fair amount of argument to back their preference—that the lists of members should be adopted as they now stood; but they must not shut their eyes to the fact that this was impossible, and that if they adhered rigidly to that position, all the time, labour, and thought which the Council had given to the question during the last two or three years would be rendered entirely futile, and they would be put back into the same position as that which they previously occupied, or even in a worse one. He was going to suggest that the Institute should feel satisfied with the effort—an honest, a consistent, and a persistent effort—the Council had made to carry out their principles, and to obtain the recognition of all members as they stood on the lists. They had done their best to secure this; but now they had to face the fact that, unless some sacrifice

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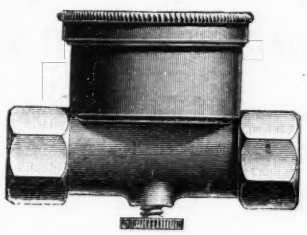

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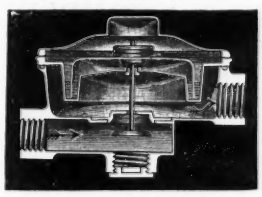

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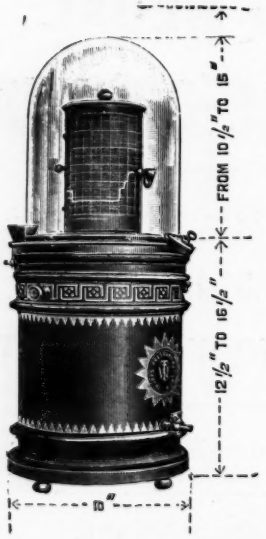

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and some concession was made, amalgamation was an idle dream. The position was not exactly where it was a year ago. There had been some movement on each side. The Institution was not so rigid on the question as it was; and their own Council had admitted that there were names on the roll of membership which might not be exactly suited to the new Society when amalgamation had taken place. So that upon both sides there had been a distinct movement towards a common ground. This seemed to give reason for hope. The difference now affected only comparatively a few. The whole of the honorary list and a portion of the associate list the Institution were quite prepared to accept; and he trusted it would commend itself to the Institute that morning to say that, in view of the disunion which prevailed, and of the mischief that this disunion worked—a condition of things which had been a perfect puzzle to the observant public, a scandal and reproach to the members of both Associations, and prejudicial to the great industry which they collectively represented—they would rest satisfied with the efforts which had been made by the Council, and express a hope that they might be crowned with abiding success. He moved that the report be accepted.

Mr. H. J. Davis (London) said it appeared to him that the great difficulty was, and always would be, the unfortunate class to which he had the honour of belonging—namely, the associates. But, speaking simply as an individual, and on the spur of the moment—though he believed his brethren in the same class would agree with him—he really felt that it was the unfortunate traders who were the cause of the block; and, therefore, he should be pleased to tender his resignation, though, in saying this, he assured the meeting that he should be most sorry to sever his connection with a body to which he had belonged for a good many years. It would indeed be very painful to him to do so; for some of the most pleasant days he had ever spent were at these June meetings. It appeared to him that the Council had stuck to them most loyally, and at some disadvantage to themselves; but it did seem that the good ship, the Gas Institute, was a little encumbered with top-hamper, which prevented her sailing into harbour. If they could cut off that top hamper, or if it would come down as gracefully as it could under the circumstances of the case, it would be better for all. Therefore, if he could induce any other of the associate members to join with him in that movement, he thought it would be better for everybody.

Mr. J. Stelfox (Belfast) said he had listened with very great pleasure to the speech of Mr. Carter, who had put everything so straight and clear that there remained very little to be said. He had always felt that they were not responsible for the admission of the members to whom objection was now taken. Some of them were, but not the Institute of to-day as a whole. There could be no doubt that the secession of the members who now formed the Institution arose from feeling entertained against one person, not because he was a trader, but because he behaved in a way which caused resentment; and this had developed into an antagonism to all traders. While he thought that business matters should not be discussed at these meetings, it would be a very great hardship, if any man chose to give up the professional part of his work, or subordinate it to business, that he should be turned out as if he had done something disagreeable. He must say that the difficulty of selecting men whom they wished to retain or whom they wished to throw out—for it came to much the same thing in the end—was a most invidious thing to ask the Council to do. He had not had the benefit of discussing these matters from time to time with other members, but his opinion had been formed by carefully reading the reports, and he certainly did think the Institute had during the past year conceded more than the Institution seemed inclined to do. If the Institution were not prepared to mention the names of the gentlemen who would be objectionable to them, they should certainly come to the resolution to strain the point, and leave all other matters to be settled. They had given up the idea of the name, had consented to dissolution, and had done everything they could; but they wished to treat their old members with something like respect. No doubt this feeling was increased by consideration of the individual names, which he need not mention; but they felt that in some cases it would not make much difference, while in others the excision of such names would mean a really serious loss to the Institute, or to the new body which would be founded. Under these circumstances, seeing that it would be extremely invidious to select a few for re-election and turn out the rest, he thought the Institution might very readily swallow that little difficulty, and let the regulation apply to the future and not to the past. There would be very great difficulty in carrying out the suggestion to include those who had rendered service to the gas industry. How could this point be settled? Some men invented things, made them, and sold them, whereas others invented things, and got people to make and sell them. How, then, were they to draw the distinction? He could not help thinking that the continual discussion of this subject would lead to a further breach rather than to reconciliation; and, seeing that they were quite agreed upon the principle of the thing, it would be very acceptable if they would take their share of the responsibility which in the past had been put upon them, and accept the present lists. He would not speak as if the whole thing were to be closed, and that this were a final vote; but he did consider that their best thanks were due to the Council, who had dealt with the matter very fairly and calmly. He had great pleasure in seconding the resolution.

Mr. C. E. Jones (Leyton) supported the resolution. He thought the Council had displayed a great deal of patience in conducting these delicate negotiations for so extended a period, and considered that to go any further would be to sacrifice the dignity of the Institute. It was well to divest this question of the halo and mists of sentimentality, and, as business men, to look at it as they would at a business of their own. The question was amalgamation with a kindred Society. What was that kindred Society? One composed of gentlemen who had seceded from the Institute. He was quite in favour of amalgamation with those gentlemen, provided they came back on equal terms. If they looked at it from a business point of view, they would ask for a balance-sheet of their possessions, so that they might see at once what they were going to amalgamate with. He had endeavoured to obtain the report of the Institution, and a statement of their accounts; but he was sorry to say he had been unsuccessful. He was told that they had no assets; they had no £1000 invested, as the Gas Institute had (and they had heard that morning that they were talking of investing more money). The Institute had also a benevolent fund. Thus, altogether, they had every reason to congratulate themselves on being in a sound financial position; and, from a scientific point of view, they could hold their own with any Gas Institution under the sun. What was the object of the Society in the first place? It was an Association of gas managers, formed by able men for the purpose of intercommunication one with another, and for mutual assistance. The first President for two or three years was the late Mr. Thomas Hawksley, who strongly advised them in the early days to help one another, to stick together, and to unite in the dissemination of truth, and then they would, he said, be regarded in the eyes of the world as they deserved to be. He (Mr. Jones) agreed very much with that sentiment. But if they were going to dissolve, and go into liquidation every five, six, or ten years, how could they expect to command the respect of statesmen, or obtain the confidence of the public? What was wanted was continuity of policy and of name, and, if possible, a unity of feeling and association. The Council had done wisely in deciding not to expel, or submit to the erasure of the names of, their own members who were proposed to be excluded. England was a trading country, and trading was an honourable business. What harm was there in a trader being connected with a society? On a memorable occasion, about twenty years ago, there was instituted a change of policy, and it was said: "Let us unite everything connected directly or indirectly with the industry." The portals were opened, and men were admitted. The honour was very much esteemed, because they came in in large numbers; and the members had heard from their own lips, over and over again, that they considered it a great honour to be associated with the Institute. Then "a change came o'er the spirit of the dream." This policy, which he approved of and supported, was now being sought to be reversed. And why? There had been a row, and a considerable amount of ill-feeling; and the Institute was to come in and be the arbitrator. Not only so, but it took upon itself a function which was illegal—it expelled a member. That member went to the Court, and the Court put him back again. Were they now going to commit, as they were asked to do, an illegal act by expelling other members, and sending them to the treadmill and putting the broad-arrow mark upon them? He was glad to see, by the report, that

they did not intend to do anything of the sort. He hoped they would remain firm in the determination which had been expressed. He was bold enough to say that, but for the extraordinary members whose names had appeared on the roll of the Institute, it never would have existed. Those men paid their heavy entrance fees and the preliminary expenses; and without their assistance, the British Association of Gas Managers would not have been represented by the Institute as it was to-day. A few years ago, there were nearly a hundred of them; to-day the number was reduced (by what ought to be called death, but which had a much longer name put to it in the report) to thirty. Surely these thirty might remain; and the associates might remain. They had no votes, and they took no leading part in the affairs of the Institute. It was no disgrace to be connected with trade. He was of opinion that Englishmen answered the description of Napoleon—they were not only traders, but "a nation of shopkeepers;" and there was nothing to be ashamed of in that. If the Institute went any further, it would sacrifice its dignity; it had gone quite far enough. They had made nearly every concession asked. They had passed a resolution that it was desirable to amalgamate; and he thought that if the same zeal had been manifested by the Institution to carry out the scheme of amalgamation as had been evidenced on their part, the matter would have been brought about long ago. He supported the report, and sincerely hoped the Council would remember that to go any further would be to sacrifice their own members, who had stuck to them bravely, and would stick to them still.

Mr. E. H. Stevenson (London) remarked that, though a member of the Council, he should like to say a few words on this matter, because it appeared to him that they were all in favour of the report, but did not all understand it in the same way. The last speaker supported it from his point of view; but that apparently was that the Council had absolutely refused to consider the question of the exclusion of traders. If they read the report through again, it would be seen that the Council began the discussion with the Institution, after last year's meeting, with a proposal that it should be optional for the Council, with the approval of the members, to re-elect any person, or to elect any person, who belonged to the Incorporated Gas Institute or to the Institution of Gas Engineers, who, in their opinion, had in the past rendered such services to the gas industry as warranted such re-election or election. At the same time, they expressed the view that they did not want to part with any of the members or associate members of the Institute. Then the second part was more pressed by the Council throughout the whole of the discussion until quite at the end, when, after the meeting of the Institution, the suggestion was made that the gentlemen who had passed the presidential chair should be elected as honorary members, and that all those who had in any way done service to the profession or business of the gas world should be eligible for election, and (inferentially) should be elected. The Council then replied that they wished, in addition to those gentlemen who had previously occupied the presidential chair being elected as honorary members of the proposed new Society, that all the existing honorary members of the Institute should in like manner be received as honorary members; and the letter just read stated that the Institution agreed to this. What difference, then, was there between them? There was none between the two Councils, whatever difference there might be between the two bodies. Certain proposals were made by them to the Institution. Those proposals were accepted, and the report was before them. The question was: Were they agreed on that, and did they authorize the Council to go forward and consummate the amalgamation? This was the whole question. He rose to make this explanation in order to put right what he thought was an error in Mr. Jones's mind, because he seemed to think that the Council had stopped at the point of refusing to part with any of their members or associates. Not only had the Council not done that, but it had agreed, and the Council of the Institution had agreed, that all honorary members, with all Past-Presidents, and all who in any way had in the past, or might in the future, prove themselves of benefit and help to the gas industry, might be elected as members of the new Institution. It was on this understanding that they ought to pass or refuse this report.

Mr. W. W. Hutchinson (Barnsley) asked what was the true meaning of the letter of May 31? Up to that, as he understood, the Council of the Institute went for the retention of all members now on the roll. Was he to understand that this letter meant a total reversal of policy? If so, had the names been given, and who were they?

The President said there were no names given on either side.

Mr. Hutchinson asked if the Council was abrogating its whole function and its duty to its present members? He did not wish to oppose the amalgamation in any way, but he wanted to understand clearly what they proposed and what they intended to do.

The President remarked that it was for the meeting to decide. All the correspondence was published; and it was for the meeting to say whether they agreed to stop at a certain point, or to go on still further in order to secure amalgamation.

Mr. Hutchinson said he understood they had simply to vote general approval of the efforts of the Council, but not committing themselves any further.

Mr. D. Irving (Bristol) said it was quite evident to him that if they adopted this report of the Council they committed themselves to everything the Council had done; and it would perhaps make things clear if the President would kindly have the last letter from the Institution read again. He thought it was an admirable one; it contained a great concession, and exhibited a very sincere desire to meet the wishes of the Institute. His own opinion was that a great deal of difficulty had arisen through the unfortunate way in which the Council summarized their requirements in February. They then, in setting forth a summary of the matters which had been discussed at the conference in January, insisted on having everything their own way. If they would turn to the report, they would find that, in dealing with this question of dissolution, it was said: "If they considered that the Institute ought to be dissolved, your Council would agree to it." But when they came to put their requirements in writing, they did not treat this question of dissolution as an open one, but said: "Touching the importance of dissolution, we feel very strongly that a dissolution of the Gas Institute is not expedient or wise;" and then they gave their reasons. It had been stated that morning that the Institution had made no concessions to the Institute; but he did not so understand the negotiations. He believed there was a very sincere desire to meet the Institute; and if they would consider the position that the Institution had taken up with regard to one class of members, the concession they had made in the letter read this morning showed a very commendable desire to meet the views of the Institute. He quite agreed with the mover of the resolution when he said that the question of dissolution and of the name was of no importance whatever, and was entirely unworthy of the place it had occupied in the negotiations. With regard to the other difficulty to which Mr. Carter had alluded, and which seemed to form the stumbling-block, he cared nothing about how it had arisen. It was sufficient for them to know that it did exist, and had to be faced. With regard to this, the Institution had offered, if he understood the letter aright, to allow the whole list of honorary members to stand, which certainly was a concession. They were meeting that morning as representatives, to a great extent, of the gas industry or its responsible advisers; and it was of the utmost importance to the Institute and to gas officials that their position should be made perfectly clear before the public. Whatever might have been permissible in the past, the time had arrived when the Institute as a technical association should clear itself of anything like reproach—of anything which would arouse the slightest suspicion with regard to its membership. The Institute met as a technical society; and in duty to the class to which he was alluding, among which were some of his best friends, and in duty to the members of the Institute, he would urge them to accept the olive-branch contained in the last letter received from the Institution. He had great pleasure in supporting the resolution, and in thanking the Council for their services.

The Secretary read again the letter of the 10th of June received from the Institution.

Alderman Miles asked if this letter was to be considered as part of the report.

The President said it was not in the report, but it would probably be better if it were included.

Alderman Miles thought it ought to be regarded as part of the report.

Mr. Jones said the resolution referred to the printed report. If this letter were to be added to it, he should like to speak upon it.

The PRESIDENT then put the motion for the adoption of the report, and it was carried unanimously.

Mr. W. R. CHESTER (Nottingham) said he felt, and he had no doubt many other members had felt, that the approval of this report as it stood left them in a somewhat indefinite position. It was merely a statement of facts regarding what had transpired between the Councils of the Gas Institute and the Institution. It was evident that they had got into a certain position, and it seemed very difficult to get any farther. The Council were now asking for instructions from the members as to what steps should be taken with regard to the future. In order to put this into a concrete form, he would move the following resolution: "That this meeting endorses the efforts of the Council to bring about the amalgamation of the two Societies, and, while reaffirming its opinion that amalgamation is desirable, requests the Council to continue their efforts to bring this about, on the basis of the inclusion of all classes of existing members of both Institutes." The negotiations which had taken place had, he believed, been carried out with conciliation on both sides, and he thought there was a sincere desire to bring about amalgamation. But there was one thing which was evident as to what was and what was not possible. The Council of the Institution had suggested that they would be willing to concede the inclusion of all honorary members. Now, this did not carry them very far; for, on looking at the list of these members, he found there were only two or three Englishmen in the entire number, and to turn out the honorary members whom they had elected—such as the Presidents of the French Society and other eminent gentlemen on the Continent—would be to make the Institute perfectly ridiculous. He found the names of the Englishmen on the list were only Mr. Alfred Lass, whom both bodies looked upon with the highest respect, and Mr. William Sugg, who was equally well regarded; and there was also Dr. Glaisher. These names comprised the whole of the English honorary members of the Institute at present. It seemed to him that the two Institutes were agreed on every single point except this. The question of dissolution they were willing to waive; the question of drafting a rule for the admission of members in future the Institution were ready to concede; the question of the appointment of President of the re-amalgamated Institute they were also willing to concede; and nothing whatever remained except the fundamental principle upon which the amalgamation should take place. The members of the Institution who were so largely responsible for the election of those gentlemen to whom they now took exception, ought to be the very last to stand out against their inclusion in the re-amalgamated Institute. If they would leave time to do its work, and draw up a stringent rule to prevent like elections in the future, they need have no fear; and he was quite sure that they had no cause to be afraid of rubbing shoulder to shoulder with many of these gentlemen, with whom they considered it an honour to be associated. He would therefore move the resolution he had read, in order that the negotiations might be continued. He hoped it would be clearly understood that without some such arrangement as that, it was beyond the power of the Institute to agree to a resolution which would be more exclusive than that now proposed.

Alderman MILES said he had the greatest possible pleasure in seconding the resolution. He thoroughly endorsed both the spirit and the letter of it, and also the words used by Mr. Chester in proposing it. He believed that if the resolution were carried unanimously it would be the best way of bringing their friends of the Institution to cordially agree with them. He hoped the members would not be divided on the subject, for to his mind the only thing now wanted was a unanimous vote on the question.

Mr. ELLERY said he should like to be quite clear as to what the resolution meant. Was it an instruction to the Council to conclude the negotiations simply by retaining all the present members—in other words, that they were not given a free hand in the matter—or was it intended to give them an opportunity to negotiate to see how far the case could be met?

Mr. CHESTER explained that he drafted the resolution on as wide a basis as he thought possible, in order to give the Council a free hand. He merely suggested that any negotiation should take place on that basis.

Mr. IRVING said that, in order that the resolution might not bind the hands of the Council in their negotiations, he would move, as an amendment—"That this meeting endorses the efforts of the Council to bring about the amalgamation of the two Societies." He did not see how it was possible for gentlemen to enter into conference with another body if their hands were tied as to what they could, and what they could not, concede. The Institute had over and over again expressed their opinion by large majorities in favour of amalgamation. They had also by large majorities expressed an opinion on the terms submitted last year. Every resolution the Council submitted was carried by a large majority. If the negotiations were to be continued and brought to a successful issue, it would not be done by tying the hands of the Council. He must say, for himself, that he should refuse to meet gentlemen who before they met had made up their minds conclusively as to the terms on which he could deal with them. It ceased in that case to be a matter of negotiation and conference; and this was just the danger here. The resolution might be interpreted as an *ultimatum*—that the other side must accept this basis or there could be no amalgamation. Could the Institution be reasonably expected to meet them and accept the terms offered?

Mr. F. W. CROSS (Lea Bridge) seconded the amendment. They had just adopted the report of the Council; and, in addition to this, they had heard the letter received last evening from the Secretary of the Institution. This report and letter provided a basis upon which the Council should proceed in further negotiations. If they took up a fresh basis—viz., that mentioned in Mr. Chester's resolution—they reverted back to the letter of Feb. 26, which was not, he thought, a proper representation of the Council's views. It seemed to him that to adopt this resolution would be to throw over the report entirely.

Mr. G. B. IRONS (Gosport) directed the attention of the meeting to a passage in the letter of the 10th of May from the Council of the Institute to that of the Institution, as follows: "They do not, however, desire (and they thought they had made this view very plain to your Council) that these two points should stand in the way of amalgamation; and rather than that should be the case they would be willing to give way upon both of them if your Council would concede what the Council of the Institute considered to be the only real point at issue—namely, the retention of the names at present on its roll." He asked whether the members thought they could go in face of this.

Mr. R. G. SHADBOLT (Grantham) pointed out that the letter of June 10 did not, in any shape or form, preclude the basis of negotiation which Mr. Chester's resolution suggested. It had been pointed out by Mr. Stevenson that the Council of the Institution had practically met them in every respect, and that there was literally nothing between them. But when they analyzed it, as had been pointed out by Mr. Chester, the proportion of Continental gentlemen who formed the honorary list was very considerable; and when they came to see the way in which the Institution had met their desires with respect to associates and extraordinary members, they found they had earmarked one gentleman—Professor Lewes—out of a total of 84. If this was meeting the wishes of the Institute as expressed up to that point, he failed to see it. Out of 84 names, surely there might be more than one who came under their own designation of gentlemen who had rendered extraordinary services to the gas industry. He supported Mr. Chester's resolution for that reason. Even if they came to a compromise ultimately, they ought still to negotiate on the basis of the representation of these 84 gentlemen. The Institution retained one; and they asked for 84. Surely there was some middle term between the two; and on this they were to negotiate.

Mr. ISAAC CARR (Widnes) supported the amendment proposed by Mr. Irving. He thought it would be a most unfortunate thing to tie the hands of the Council in any way. Mr. Davis, by the remarks he had made that morning, had placed the Institute under a great obligation; and he was confident that many other gentlemen associated with him would take the same course. They had now only to leave the matter free and open, as was proposed practically by the adoption of the report, and then things would soon take shape and terminate as they all hoped. He believed that, after the conciliatory manner in which every speaker had dealt with the subject that morning, they might confidently leave the matter to be settled by the Council; and before another year he thought they would see the two Institutions united.

Mr. STELFOX said that this question went on from year to year. Each year they expected something, but nothing conclusive was arrived at. Nothing was so disappointing

as to work with a knowledge that, after a great deal of time, trouble, and expense had been incurred, it might all come to nothing. If the Institute had now firmly made up their mind that they would not suffer the exclusion of their members, it would save time and trouble to say so, and not to allow the Council to go on year after year, summoning meetings, writing letters, and all that sort of thing, and in the end find that some half-way house was reached which the Institution was determined not to accept. He really thought it would be desirable to come to a final decision one way or the other. If it was not to be, then let the matter be ended, and let all this correspondence and strife cease.

Mr. WILLIAM CARR (Stalybridge) remarked that he did not wish to say anything to increase the difficulties of the Council, or which would put back the chances of amalgamation; but he thought somehow or other they must have missed their way in the process of negotiation. When he looked back to the very beginning of things, he saw, in the report which Mr. Helps gave to the Institution, that when they met to consider it first they passed this resolution unanimously: "That providing the conditions of qualification and membership should be satisfactorily arranged, reunion would be desirable." This was a very open and wide resolution. It did not say anything about expelling any members or about the difficulty of taking over any who might be objectionable to them. It simply, as he took it, if it meant anything at all, referred to the conditions with regard to the election of new members from the time of re-union; and he should imagine this was the spirit in which the resolution was moved and carried. How they had got away from this position, he did not know; but subsequently to that they went very far astray in the process of negotiating. With regard to the letter of Feb. 26 (which seemed to have given so much offence, and to have done so much harm), it was only intended to be a digest of the expression of opinion which they had given utterance to in the conference. The conference was carried on in a very amicable spirit; they met the Council of the Institution in the most cordial manner, and they were equally cordial on their side. Although they did not express any opinion of their own to any great extent, they did not dissent very much from the opinions which the Institute Council expressed. In fact, when they discussed the question with regard to the inclusion of the whole of the members on the roll, as was pointed out by Mr. Stevenson at the beginning of these negotiations, after the last meeting, they began with a very open resolution—a resolution calculated to give the widest possible basis; and if the Council of the Institution would only meet them they thought something might be built up, and they would soon come to a conclusion. They were not anxious to put any sentimental considerations in the way. But, after all, when the points of difference were settled, questions of detail would have to be considered; and so when they met the Council to talk matters over, they put forward the claim on which the Council at that time had determined to stand or fall, because they felt they had no power from the resolution of the annual meeting to expel any of the members. They were justified in doing almost anything else to bring about amalgamation, but not that. Moreover, they went carefully through the list of members, and found something might be said for so many of them as to why they should be retained, that they thought those who could be excluded from the new Society were so few in number that it was hardly worth the trouble of turning them out. When they considered that no addition had been made to these members since 1897, and very few for several years previously, that the numbers had been rapidly reduced, and that many of the members were past middle age, the possibilities were, if no other additions were made, that the numbers would go on reducing rapidly; and they thought it would be a small thing to ask the Institution Council to accept the members, if they were prepared to give way on every other point. Before going to the joint conference, they determined to insist on nothing but this. Every other point was subsidiary—a matter on which they might agree or not; and if the Institution did not agree, they only had to say so. This was distinctly stated at the time; and they might judge how surprised they were when their communication was placed as a kind of ultimatum before the members of the Institution. Perhaps it was their fault for not having made it more clear in their written statement; but it certainly gave him the impression at the time that the Institution Council were not in favour of amalgamation at all, and were taking steps to prevent, rather than to encourage it. This, however, might be a mistake on his part; and he did not wish to insist on it. But he felt considerable annoyance when they received no answer for such a long time, and then only the reply that the matter was to be submitted to the members on May 4. There was no necessity to submit anything if they did not approve of the proposal. The only thing they need have submitted was the question of the retention of the Institute members. This was the only point at issue between them. He was sorry they did not do that, because they might have had more information as to the wishes of the members of the Institution. He thought there was one thing made manifest by the discussion—that whatever the feeling of the Council might be, a very large section of the members were desirous of amalgamating. He believed this feeling was reciprocated by a large section of the Institution; and he hoped and trusted that, in course of time, they would be able to amalgamate. There was no doubt it would be for the general good; and he supported the resolution because he thought it gave their Council the opportunity of approaching the Council of the Institution with a much stronger hand than the amendment would do. If he understood the meaning of words, "basis of the membership-roll" meant only that the Council were supported in contending for the retention of some at least of those members who were on the roll, and they were not receiving instructions from the meeting to exclude anybody. If they could come to some general arrangement with the Institution—if, for example, a Joint Committee could be appointed of the two bodies, who should go through the list and revise it, and say how many should be re-elected and how many should not—this resolution would not prevent that being done. He hoped, for the reasons he had assigned, that the Council of the Institution would yet see their way to accept the whole membership-roll. But, if they could not, he would not like to see the matter fall through if a certain number were retained. He might mention the name of Mr. Charles Hutchinson, who was a comparatively old member, having been elected in 1871. He was a gas manager, and had the full qualification. During the whole thirty years he had been a member, and paid his subscription to the Institute, not a single word had been said against him for any misdemeanour or touting for business, or anything of the kind. He had conducted himself as a member and as a gentleman during the whole of the time; and he should very reluctantly part with him. Then, again, there was Mr. Duxbury, who had been a member of the Council of the Institute, whom also he should like to see retained on the list. If he went through the list of traders who had never been gas managers, he might refer to Mr. Thomas Fletcher, of Warrington, a man who had read papers before their Society and others, who was eminently a scientific and technical man, and not a business man at all. He was connected with a business firm; but he (Mr. Carr) never met him in business in his life. The only time he had ever seen him was when he had been reading a paper or discussing one at some scientific meeting. These were illustrations of what he should like the Council of the Institution to see their way to meet them upon. Another point raised in the letter last read was that of electing the Past-Presidents to be honorary members. The objection he saw to this was that honorary members would pay no subscriptions; and he thought it would be a great loss to the funds if all the Past-Presidents were to be transferred to the honorary members list—and not only all the Past-Presidents, but those other gentlemen on the lists whom they might think worthy of being retained as members. He should not like to lose all their subscriptions; and he did not think it would be wise for the Society to do so. Besides, putting a man on the honorary list was like fossilizing him—taking him out of the active arena, and putting him on the shelf. A man who was made an honorary member could not pretend to come there and discuss such questions as they were discussing that day. It would ill become him as a non-subscriber to give a vote as to the best way of conducting the business; and it was a matter of business to consider who were to be members, and what kind of members they were to be. He hoped the resolution would be passed, with the understanding that it left an open door for negotiation. The last twelve months had been very disappointing in many respects; but the discussion had to some extent cleared the air, and he hoped they were a little nearer together. After the masterly speech made by Mr. Carter in moving the adoption of the report, he thought the view now put forward would commend itself to the members of the Institution.

Mr. STEVENSON asked Mr. Chester whether the inclusion of all classes of existing members meant the inclusion of all existing members; or did it mean that they were to have honorary members, associate members, and associates?

Mr. CHESTER said it meant the inclusion of all individuals who were members of any existing class at the present time. Whether they were brought into one class afterwards or not was quite a different matter.

Mr. JONES expressed the hope that the amendment would be withdrawn, and that the meeting would vote unanimously in favour of the motion, which he cordially supported. He thought this was the only safe course to pursue. If they adopted the amendment, they would still have the door open; and it could be kept open for twelve months longer. But in accepting Mr. Chester's motion, they gave a definite and decided instruction to the Council, which would strengthen their hands, and he hoped would bring the negotiations to a successful issue.

Mr. G. R. HISLOP (Paisley) thought it would be most impolitic to tie the hands of the Council. The Council of the Institution having conceded so much, he thought the matter should now be left to their own Council to do the best they could. To tie them down too strictly, as the resolution would do, would be to shut the door again for some time to come.

Mr. T. BERRIDGE (Leamington) expressed the opinion that if they carried Mr. Chester's resolution they might be putting off amalgamation for ten years.

Mr. CARTER said he thought the meeting was in imminent peril of making a mistake, and becoming confused as to the real meaning of the resolution. He had no great opinion of a resolution which required a number of speeches to define it. If the words to which Mr. Irving raised an objection really meant what Mr. William Carr said they did, it seemed the easiest thing in the world for a man of Mr. Chester's capabilities to express in clear English exactly what he meant. It would not hurt the resolution very much if these words were deleted. It might be passed *minus* those words, but *plus* an expression of the desire which had been manifested in the course of the discussion.

Mr. CHESTER said, as he understood it, the word "basis" meant something on which one could build. What they were going to build on that basis was quite an open thing. He used the word "basis" as a means on which the negotiations as to the amalgamation should be carried on. The basis suggested by the Institution in the last letter was that they should admit one associate member and two English honorary members. As an alternative to this, he had suggested another—namely, that the negotiations should be carried on upon the basis of including the whole of the existing members of every class. The language was quite accurate enough, and there need be no fear, if the resolution were carried, that it would be the means of closing the door to further negotiation. He should be very glad if Mr. Irving would withdraw the amendment.

Mr. IRVING said that, on the contrary, he was never more convinced of the necessity of it than he was after hearing Mr. Chester's explanation.

Mr. J. P. LEATHER (Burnley) expressed himself as strongly in favour of Mr. Chester's view, that they should retain all the present members, because he had never seen any reason why they should omit any of them. Reasons had been given, which there was no need to refer to again; but he did think, in order that they might vote properly on the matter, that the resolution should be altered somewhat in the way suggested, and, instead of asking the Council to proceed on the basis of the retention of the members, that they should express an opinion that the Council should endeavour to retain the existing members, leaving out the word "all."

Mr. HUTCHINSON thoroughly endorsed Mr. Chester's proposition. After the very handsome expression of a desire for reunion which had been made that morning, the Institution must be convinced that on the main points they were thoroughly at one, and had shown a genuine wish to meet all their legitimate objections so far as previous negotiations had shown them. He was strongly in favour of amalgamation; but he thought the way in which Mr. Chester had put the resolution was quite sufficient. It was a basis on which the Council would have a general direction to negotiate, but it did not tie their hands in any way; and he thought the members of the Institution, when they read the report of the discussion, would in all probability be ready to meet them in a liberal fashion.

Mr. W. HARDIE (North Shields) supported the amendment. He said he had heard with very great pleasure the eloquent opening remarks of Mr. Carter, and thought from what he had said, and the able way in which it was stated, that they would all be very careful not to throw any obstacle in the way of amalgamation. If Mr. Chester's motion was going in any way to tie the hands of the Council, so as to prevent amalgamation, they should be very careful about accepting it. He hoped the Institute would give the Council a free hand in the matter. They were working for the best interests of the gas industry, and he trusted that the members would not, year after year, pass over resolutions carefully prepared by the Council.

Mr. W. D. CHILD (Romford) said one of the Council had asked if the members approved of what had been done. He thought the carrying of Mr. Chester's resolution would show exactly what the members desired. The Council would have a direct expression of feeling as to the terms on which they wished amalgamation. They were willing to give away almost everything except their old friends and their own members. They were desirous of retaining them rather than getting new ones; and he hoped the resolution would be agreed to.

Mr. ELLERY said he really did not feel himself prepared to vote without some further explanation. If the President would clear up the difficulty by telling him whether he thought that they could go before the Institution armed with that resolution, and that the negotiations would go forward pleasantly, he should vote for it; but if the Council said their hands would be tied, and they could not proceed, he should vote against it.

Mr. W. S. HADDOCK (Warrington) said the resolution merely tied them to this extent, that every member should be considered, and that his election or non-election would lie with the two bodies; but every man's name should be properly considered at a joint meeting.

Mr. STEVENSON said if this were Mr. Chester's meaning, and he would put it in the form of a resolution, he (Mr. Stevenson) was sure it would be carried unanimously; but any instruction would tie the hands of the Council—it did not matter what that instruction might be. If the meeting did not give any, the Council could go forward.

Mr. R. PORTER (Elland) considered the Council ought to have definite instruction as to what was in the mind of the members. He thought the course taken had been a great mistake. They were admitting all along that the constitution of the Institute was wrong. If this was so, why not bring up a new rule to set it right?

The PRESIDENT was about to put the resolution, when

Mr. ELLERY again asked for an opinion as to his view on the effect of the resolution tying the hands of the Council.

The PRESIDENT said, as he read the resolution, he did not see that the hands of the Council were tied. The inclusion of all classes did not necessarily mean that every man in those classes would be retained. This was how he should read it.

Mr. CHESTER said he put that as the basis upon which further proceedings should take place, not that it should be adopted as a rigid definition.

The amendment was then put and lost by a large majority —28 hands only being held up in its favour.

Mr. LEATHER then moved a further amendment to omit the last sentence, as before, and to insert in its place "and desires the Council to proceed with the negotiations with the view of retaining the existing membership."

Mr. CARTER seconded the amendment, because he thought the words expressed better than those used by Mr. Chester, what he said was his intention.

Mr. J. C. BELTON (Chester) said it was quite evident that the mind of the meeting was in favour of retaining the whole of the existing membership; and he must say that, after weighing all the *pros* and *cons* of the matter, he had come to the conclusion that they could not do anything else. But he thought they ought to give a definite instruction to the Council. They had almost, if not quite, a parallel case in the Institution of Civil Engineers, who, having come to the conclusion that they had made a mistake in admitting certain people to membership in past years, did not ask them to retire, but formed a new basis of membership for the future. All that the Institute need do, in order to bring about the amalgamation of the two Societies, could be done on that basis, and the thing would right itself in the course of a few years.

Mr. W. HIGGS (Basingstoke) suggested that after the

word "basis" the words "and, if possible, the members be retained," should be inserted.

Mr. IRVING said this long dicussion, and the confusion which had arisen, only showed what a great mistake it was to set about giving instructions to the Council. Why not pass a vote of confidence in the Council, and leave the negotiations with them?

Alderman MILES strongly advised Mr. Leather to withdraw his amendment, and get a unanimous vote. It was not fair, he said, to keep parading the statement that the door was to be shut when it was not, and when Mr. Chester plainly stated that he did not intend it by his resolution. He would like to get the whole of the members included, and so would they all. But if it was impossible, as it might be, he had a notion that, like Mr. Davis, some would voluntarily retire, and set the whole difficulty at rest. He trusted, however, they would go before the Institution with a united vote. He appealed to them all not to vote from any feeling of passion; for if ever there was a moment for calm and careful consideration, it was now. He most earnestly hoped that the amendment would not be passed, but that the motion would be carried unanimously, when he believed it would have an enormous effect.

Mr. W. CARR, as a member of the Council, said they wished to know what was the feeling of the members on this matter. They did not want an absolutely free hand. They would like to know what the members desired them to do; and Mr. Chester's resolution would give them a chance of saying something on this point.

The amendment was put and negatived by an overwhelming majority. The resolution, as moved by Mr. Chester, was afterwards put, and carried with only three dissentients. The meeting then adjourned.

THE BENEVOLENT FUND.

The Annual Meeting of the Donors and Subscribers to the Benevolent Fund was held at the conclusion of the proceedings on Tuesday morning. Mr. T. H. MARTIN was voted to the chair.

The SECRETARY read the minutes of the last meeting, and they were confirmed.

The annual report was taken as read, and adopted on the motion of Mr. S. W. DURKIN (Southampton), seconded by Mr. T. BOWER (West Hartlepool).

Mr. J. MORTON (Ashford) said he should like to see the Committee a little more liberal in the relief they granted, and not carry money forward for other people to spend. He thought the year's income ought, as nearly as possible, to be expended in the relief of deserving cases known to the Committee.

The CHAIRMAN said the suggestion should be considered at the next meeting of the Committee.

Mr. T. BERRIDGE (Leamington) asked if something could not be done to arouse more interest in the fund, so that a greater number of members might stop to attend the meeting, instead of there being only half-a-dozen present. He would suggest that they might have some system of votes, as was done in connection with Masonic charities. If this were done, it might grow into a big thing.

The CHAIRMAN said a circular was sent out every year to each member of the Institute, recording what was going on, how much money was raised, and how much spent. He did not quite see how they could adopt the principle of voting; but anything that could be done to popularize the fund would be considered. He quite agreed that there was not enough interest taken in it.

Mr. BERRIDGE thought if they adopted a scheme by which a subscription of two guineas carried a vote it would be useful.

Mr. SPENCER thought it would be rather detrimental to the interests of the fund if those who applied for relief had to make their cases known, in order to obtain votes. It had always been left to the Committee to administer the fund; and he was afraid the interests of the Society would suffer if other methods were adopted. They followed the lines laid down by the Institution of Civil Engineers; and he did not think they could have a better precedent.

Mr. BOWER said it was very difficult to get members to take even an outside interest in the matter; and in dealing with the cases which came before the Committee, it had sometimes been extremely difficult to get the necessary information in order to judge of their merits. He had been connected with the Committee for many years, and would be exceedingly glad if outside members would take a little more interest in it—not only in looking after deserving cases to suggest to the Committee, but in furnishing such information as would enable the Committee to judge whether the cases were deserving. The Committee quite appreciated Mr. Berridge's desire that greater interest should be taken; but as to making cases public, he might say that many which came before the Committee were such as it was certainly undesirable to bring before the public in detail. They might safely leave these matters in the hands of the Committee, to use their best judgment as to what should be done.

A vote of thanks was then accorded to the Chairman, and the proceedings concluded.

THE LECTURE AND PAPERS.

On the resumption of the proceedings the next morning, the technical portion of the programme was taken in hand, and carried through in the following order:—

Wednesday.—(1) "The New Table Photometer and Ten-Candle Pentane Lamp." Lecture by Dr. FRANK CLOWES, F.I.C. (2) "Why I Adopted Water Gas." By W. LANGFORD, of Longton. (3) "British Water Gas Practice." By R. PORTER, of Elland.

Thursday.—(4) "High and Low Pressure Gas Incandescent Lighting." By W. SUGG, of London. (5) "Self-Intensifying of Gas Pressure by Means of Waste Heat." By C. SCOTT-SNELL, of London. (6) "The Effect of Quality and Pressure of Gas on the Efficiency of Incandescent Gas Lighting, having regard to Economy." By W. GRAFTON, of Beckton.

To-day we give the lecture and the papers by Messrs. Langford and Porter, with a report of the discussion upon them; leaving the remaining papers and discussions for the next issue of the "JOURNAL."

AN EXPLANATION FROM DR. CLOWES.

On the re-assembling of the members on Thursday morning,

The SECRETARY, at the request of the President, read the following letter received from Dr. Clowes:—

June 12, 1901.

Dear Mr. President,—I regret that actual readings on the photometers to-day were impossible, owing to the fact that the compressed gas from the bottles turned out to be of only 10-candle power. The photometer does not read as low as this. Your members were good enough to say that they fully appreciated the demonstration, but it was a disappointment to my assistants not to be able to show actual equality of readings. Of course, the difficulty arose wholly from the fact that there was no gas supply in the building. Perhaps you could explain this at your meeting to-morrow.—Yours truly,

FRANK CLOWES.

INTERCHANGEABLE METER-UNIONS.

The PRESIDENT said it had been suggested that a resolution should be passed expressing the approval of the Institute of the action of the North British Association of Gas Managers, with regard to obtaining interchangeability in meter-unions.

Mr. W. HARDIE (North Shields) said he did not think it was necessary to take up time by making a speech on this subject. They all knew how desirable it was that meter-unions should be made interchangeable, and were acquainted with the long, arduous, and valuable labours of the North British Association towards this end. He would therefore move that the Institute should express its approval of the action taken by that Association.

Mr. R. PORTER (Elland) seconded the motion.

Alderman MILES (Bolton) asked what had been done in this matter since the discussion that took place under the presidency of Mr. Stewart, of Greenock, when it was relegated to the Council for the purpose of taking such action as they thought desirable. Since then they had not heard anything about the subject; and he was rather surprised at the form in which it now came forward. He hoped the Council had given it their attention; and he should be glad to know what really had been done.

Mr. J. HEPWORTH (Edinburgh), being called upon by the President to answer the question, said he felt rather reluctant to speak on this subject, but he knew something of what had been done—not by the Institute, but in Scotland. The resolution now proposed did not ask for an expression of opinion that uniformity was desirable—that was taken for granted; but it was a very difficult question to deal with, and the difficulty arose, not with the makers but with the

users of meters. To go back for a moment, the matter was raised in a very complete manner at the North British Association meeting in 1895 by Mr. Napier Myers, who said in his paper that he had come to the conclusion that the Whitworth standard gas thread would be the best for meter-unions. After that the Association prepared a set of unions to the Whitworth gauge; but it was felt that there would be great difficulty in taking up this question in Scotland alone, apart from what was supposed to have been done some years previously by the Standards Department of the Board of Trade. It was also felt that there would be trouble in dealing with the matter unless they could all be brought into line. Of course, every man, on whichever side of the Border he might be, would feel that to add another set of standards would, under certain circumstances, be simply to increase the difficulty. What they would wish, and what must be done, if they were to succeed, was to get into line on this point. Mr. Myers also said, in the paper to which he had referred, that he wanted the Association to stir up the Standards Department to legalize these proposals as a common standard, and then all other patterns would be special. If the unions which were prepared to this gauge should be taken up by the Department, or even without it, by the general consent of meter users, the difficulty would be at an end. He did not know what steps the Institute had taken in order to further this last suggestion of Mr. Myers, but something of the sort seemed desirable. At all events, they in Scotland felt that the question was surrounded with very many difficulties, in view of the possibility of the Standards Department taking it up at another date; and they therefore unanimously agreed that the matter might be postponed (say) for twelve months. Though it was felt that there would be great difficulty in adopting the proposed standard of the Whitworth thread, it was suggested that a give-and-take policy might be adopted, with a view of making pretty well every meter-union interchangeable. This was the position at which the question had now arrived under the auspices of the North British Association. They had done very valuable work; and it only needed to be completed by the action of the Institute combined with the Institution. But it was highly desirable that, in trying to get out of one difficulty they did not get into another. He should feel great hesitancy in taking any course himself that morning, except by way of referring the matter to a Committee of the Institute for their further consideration. Supposing the set of standards proposed were adopted, the question arose as to whether it would be done generally; then there was the further question as to whether the Standards Department would give it their approval; and, lastly, there was the question whether it would only be adding one more to the number of gauges at present in use. Altogether, the subject was surrounded with considerable difficulties. He did not think any trouble would arise with the meter makers; it arose in setting up a standard which, perhaps, nine-tenths, or some less proportion, of the users of meters would not adopt. If the Institute could render any assistance in furthering this matter, it would be a good outcome of the discussion. At any rate, it was very desirable that they should all get into line, which they were not at present. It was a matter for grave consideration; but perhaps the Council of the Institute would not mind taking up the matter, and seeing what they could do to carry out the suggestion made by Mr. Hardie, which would not be furthered by simply passing the resolution.

Mr. W. W. Hutchinson (Barnsley) said this was a matter in which he felt they might easily make a mistake if due care were not taken. He agreed that the subject should be referred to the Council, who should appoint a small number of their body as a Committee, and have power to add to it such gentlemen as might be thought desirable, whether they were members of the Institute or not, and also to confer with the Institution, and report further progress. They were all unanimous in the desire to have one standard of meter-union; but simply to carry the resolution which had just been proposed would, he thought, make the confusion worse.

Mr. J. P. Leather (Burnley) said that he expressed the opinion, when the subject came up at Belfast, that there was no difficulty in anyone getting what he wanted from the meter manufacturers. He had no trouble himself; and if he wanted meters from a maker with whom he had not previously done business, he could have them made to agree with what he was already using. Of course, the question would then arise whether his unions would match with the proposed standard. He thought if the Council thoroughly considered the matter, proposed a standard, which might be that already suggested, and then communicated with gas engineers throughout the country and asked them whether or not they would undertake to adopt it, they would not run the risk of failure. He believed the sizes generally used at present were all Whitworth threads; but it would not be well to go in for any standard until they knew the opinion of engineers generally.

Mr. C. H. Hutchinson (Barnsley) said this was far too important a matter to be decided at that meeting, and it should be referred to a Committee to be settled in consultation with the meter makers, who would be pleased to give all assistance they possibly could. They were agreed that uniformity was desirable; but the difficulty arose when they discussed the method of attaining it. He thought going in for a real standard of Whitworth thread would be the proper course to adopt. It was already a national standard, and last year, at the Paris meeting, it was proposed to have an international standard. If they could get the Whitworth thread adopted in England, there would be little difficulty in going a step further. But there was another way of looking at the question. It would be found, if the matter were gone into, that at least two-thirds or three-fourths of the meter-unions were already interchangeable; and therefore, in order to make the change with the least cost and trouble, the proper way would be to adopt the union which was at present most largely used. He therefore thought the proposition before the meeting was not quite right; and if they adopted this standard they were adding one more to those they already possessed. This question had been brought up on several occasions, and had been pretty well thrashed out; but he had noticed that in every discussion it had been stated that if any particular standard was required they had only to ask for it. This was the case. Meter makers would do almost anything in reason, and sometimes beyond it. He had already about a dozen customers who required to have their own standard. The difficulty in connection with this was that meter makers could not make stock, because they did not know what unions would be required. The ultimate result would be to delay delivery and increase the cost, which would ultimately fall on the users; and the "last state" of meter-unions, under those conditions, would be "worse than the first." He was not authorized to speak for the meter makers in general; but he thought that if gas engineers would only make up their minds as to what they wanted, makers would be quite willing to supply them.

The Secretary then read the following letter:—

INTERCHANGEABLE METER-UNIONS.

Arbroath, March 19, 1901.

Walter T. Dunn, Esq.

Dear Sir,—As you are aware, the North British Association of Gas Managers have in the past devoted considerable time and attention to the question of the standardizing of meter-unions; and while they have not hitherto succeeded in getting a uniform standard adopted, they agreed among themselves to accept a series of interchangeable unions from the meter makers of Scotland, and which was to have come into operation on the first day of the present year.

At a meeting of the Council held on the 16th of January, it was thought advisable, in view of the fact that the question had been raised anew at a recent meeting of the Midland Association of Gas Managers, when Mr. Bell, of Derby, laid before the meeting important statistical information as to the serious variations in the meter-unions supplied throughout the country, that, before finally introducing the interchangeable unions for Scotland, the Council should communicate with the Councils of all kindred Associations, and with the meter manufacturers, and first ascertain whether there is any possibility of the question being considered nationally, and a uniform standard adopted throughout the country.

With this object in view, I am instructed to address this communication to you, and ask you to bring it before your Council at their first meeting, and, if possible, to favour me with a reply before the 30th of June next, and to say that, while the North British Association are quite prepared to delay the introduction of their interchangeable standard for a short period, the Council are not prepared to recommend its delay longer than the 1st of January, 1902, unless there are clear indications of the question being promptly dealt with by the kindred societies and meter manufacturers.—Yours truly,

(Signed) Robt. S. Carlow, Secretary.

Mr. R. Watson (Hertford) asked if anyone could state what was the thread most in use at present, so that they could form some opinion as to whether or not the one proposed by the North British Association would meet with general approval. There were several gentlemen present

connected with the meter industry, and perhaps they would be able to inform the meeting whether this standard was the one most generally in use.

Mr. HEPWORTH said it was not. It was an accommodating standard; and he did not think they were specially proud of it. It was not very satisfactory in every respect; and that was why, if the matter, as had been suggested, were submitted to a Committee, they could see the merits or demerits of it as compared with the one which was most largely used, or with the Whitworth standard, which the North British Association had made.

Mr. J. M'GILCHRIST (Dumbarton) said the Council, in discussing this question, felt that by adopting the standard suggested by the North British Association it would simply be adding one more to the many already existing, and therefore they considered it would be better not to go further into the matter. He had always been of opinion that they should have a standard, and that it should be the Whitworth; and he thought a suitable time to introduce a new standard would be the beginning of a new century. He trusted the suggested Committee would really take up the subject seriously, and bring it to a successful termination.

Alderman MILES asked what the terms of the resolution were.

Mr. HARDIE said he did not think the resolution, as proposed, committed the Institute to anything; it was simply expressing approval of the action taken by the North British Association of Gas Managers. All it committed them to was the recognition of the work the Association had done in this matter. They had accomplished a good work; and, so far as they had gone, they ought to be thanked for it. Whether it was desirable now to ask the Council to go further into the subject with the Association, for the purpose of fixing a standard, was another question. He thought it was desirable; but this was not contained in the resolution.

Mr. HUTCHINSON said he understood that if they passed the resolution it committed them to hold to the decision of the North British Association, who had, he thought, fixed upon a definite standard. He felt very strongly that an error might be committed in doing this without further consideration. They were all agreed about it.

Alderman MILES thought it would be a pity to pass the resolution that morning, particularly after the expression of opinion of gentlemen so distinguished as Mr. Hepworth and Mr. M'Gilchrist. He considered that they should go back to the resolution passed three years ago; and he again expressed his disappointment that the Council had not made any progress. There was now, he said, apparently a desire to take action; and the hands of the Council would be strengthened by passing a resolution that they should take this matter into serious consideration, with a view to some decisive action, and they might report at the next meeting. In his opinion, this would be the proper course to pursue. He would respectfully suggest that the resolution should be withdrawn, and that such a one as he had indicated should be moved. The Council would then see that the Institute were in earnest. Both Mr. Hepworth and Mr. M'Gilchrist seemed to be in some doubt as to adopting the standard suggested by the North British Association. He (Alderman Miles) considered that the Council should put themselves in communication with the Association and with meter makers; and he was quite sure the latter would fall readily in line with them, and do what was required.

The PRESIDENT said he thought the members now understood the position. They were much indebted to the North British Association for taking up this matter, which the Council had had to put aside really through the pressure of other work. He considered that it would somewhat tie the hands of the Council if the resolution were passed, because it would be admitting that the standard proposed should be adopted. He thought that most of the members would be desirous of having the Whitworth standard adopted, which was known throughout the British Islands. If Mr. Miles would move a resolution, the Council might again take up the matter seriously; and it would probably be better for them to ask the assistance of the meter manufacturers and anyone else they thought desirable.

Mr. W. W. HUTCHINSON said, in order to clear the ground, he would move an amendment.

Mr. HARDIE said this was not at all necessary. If Mr. Hutchinson would propose a resolution on the lines Mr. Miles had suggested, he certainly would at once withdraw his resolution.

Alderman MILES then moved that the matter be referred to the Council, with full power to do all they thought necessary to bring this question to a successful issue, and to report, if possible, at the next annual meeting of the Institute.

Mr. W. W. HUTCHINSON seconded the motion, and suggested that the Council should appoint a small Committee to deal quickly with the matter, and, if practicable, bring it before the International Congress to be held in Glasgow in September. The North British Association, who had done so much in this matter, had been very sincere in their efforts, which should be properly appreciated. This would give a good chance of bringing the question to a satisfactory conclusion, and possibly on an international basis. He would also suggest that a communication should be made to the Institution of Gas Engineers on the subject.

The motion was then put and carried unanimously.

REPORT OF THE SCRUTINEERS.

The SECRETARY read the report of the Scrutineers as to the election of office-bearers for next year, as follows:—

President.—S. W. Durkin, of Southampton.

Vice-Presidents.—A. Dougall, of Tunbridge Wells; and T. H. Martin, of New Barnet.

New Members of Council.—A. Graham, of Mansfield; G. R. Hislop, of Paisley; J. H. Troughton, of Newmarket; and C. Wood, of Bradford.

Auditors.—W. D. Child, of Romford, and Samuel Wood.

Honorary Secretary.—J. Davis, of Gravesend.

MEMBERS.

Allan, Nicol, Larne.
Alley, H., Wells.
Anderson, R. B., Fermoy, Carrick-on-Suir, &c.
Andrew, A., Oldham.
Baldwin, J., Gainsborough.
Brookman, A. H., Pembroke Dock.
Gray, J. A., Cleator Moor.
Harris, A. T., Market Harborough.
Higginson, F., Broadstairs.
Hughes, J., Hoylake.
Jones, T. B., Dronfield.
Keys, R. S., London.
M'Lusky, W. B., Perth.
Onions, E., Loughborough.
Ousey, T., Salford.
Page, H. C., Canterbury.
Paterson, R. O., Cheltenham.
Robinson, T., Sutton-in-Ashfield.
Simmelkjör, Sophus, London.
Smedley, G. B., New Mills.
Simmonds, S. J., Farnham.
Turner, J. W., Mirfield.
Wimhurst, H. R., Irthlingborough.
Wright, E. W., Driffield.

ASSOCIATE MEMBERS.

Akam, H., Bradford.
Bennett, W. H., Yeovil.
Bissell, A. W., Birkenhead.
Bromley, A., Batley.
Clowes, C. P., Gorleston and Southtown.
Durkin, S. W., jun., Sydney (N.S.W.).
English, R., Lower Sydenham.
Hutchinson, E. G., Barnsley.
Lang, J., Dumbarton.
Mitchley, J. W., King's Lynn.
Packham, H. W., Kingston-on-Thames.
Ruggles, H. G., Northampton.
Saville, H. W., Dorking.
Stephenson, S. O., West Bromwich.
Townsend, W. W., Wakefield.
Wynne, J., Dundee.

TRANSFERENCES.

The following were reported to have been transferred from the class of associate members to that of members:—

Acland, S. J., Ballymena.
Dowse, W. J., Bradford.
Hoyte, P. S., Plymouth.

ELECTION OF AN HONORARY MEMBER.

The PRESIDENT proposed the election of the President of the Société Technique du Gaz en France (M. Lebon) as an honorary member of the Institute.

Mr. DURKIN, in seconding the proposition, thanked the members for the honour they had conferred upon him in electing him as President for the ensuing year. He hoped they had done the right thing; and he would do his duty to the best of his ability.

The motion was carried unanimously.

VISIT OF THE FRENCH SOCIETY TO LONDON.

The PRESIDENT said the Council had been in communication with the Council of the Gas Institution with regard to entertaining the members of the French Society when they came to London next month. They had also been in communication with the three Metropolitan Gas Companies, who had undertaken to entertain these gentlemen, and show them over their works and other places of interest. They had not yet received any definite reply from the Institution; but full particulars would be sent to each member as soon as possible, indicating what arrangements had been come to.

THE INTERNATIONAL CONGRESS IN GLASGOW.

The SECRETARY asked Mr. J. W. Helps, Honorary Secretary of the Gas Section of the International Engineering

THE

WELSBACH INCANDESCENT GAS LIGHT COMPANY, LD.

Invite the attention of Gas Managers, Lighting Authorities, and all interested in Public Lighting, to their new Patent

SELF-INTENSIFYING KERN BURNER

just introduced, which gives a lighting efficiency of

300 CANDLES PER BURNER

with about 10 cubic feet of gas **at ordinary pressure,** dispensing entirely with auxiliary compressing plant of any kind whatever.

ADMIRABLY ADAPTED FOR ALL CLASSES OF LIGHTING.

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TO ALL WHOM IT MAY CONCERN.

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Congress in Glasgow, to state what steps had been taken with regard to the meeting.

Mr. HELPS said he was glad of the opportunity of doing so, because it was really important that as many members as possible should know what was the present position. He believed that this conference of the united engineering societies was going to be far more important than even the authorities in Glasgow, who were responsible for it, themselves thought. There were many difficulties which had been overcome, and there were still more which would have to be surmounted before the arrangements were complete. The present position was this: First, bodily accommodation; secondly, mental accommodation. The first matter gave rise to considerable difficulty. They found that, so far, 3000 names had been sent to the Committee in Glasgow of people wishing to attend, and 120 of them were ladies. So far there was accommodation in Glasgow for only about one-third of this number; and the difficulty of providing it was very serious. In all probability it would be found necessary to take rooms outside the city. But it did not appear that there were many places within easy distance, and it would probably necessitate a ride of at least an hour to reach either Edinburgh or Troon. As Secretary of the Gas Section, he should much like to know of any gentlemen intending to be present who would not object to leave Glasgow at eleven o'clock, and get to Troon—a charming little place on the banks of the Clyde—for the night, leaving again at 9.40 in the morning, and paying 4s. 6d. first class or 2s. 6d. third class fare for the journey. He believed that those who cared to go there would find they were probably treated better than in the crowded city. Again, with regard to ladies, he was afraid the accommodation for them would not be so perfect as it might be. They all knew that the accommodation in exhibition times was not always of the best; and he should certainly think twice himself before taking any ladies. At the same time they would be made welcome; and accommodation would be found for them, and excursions arranged which they could attend. With regard to the papers promised and those intending to be present, he had been in communication for some time past with the various institutions on the Continent and in America; and a great many of them had signified their intention to support the Congress. The Belgians were sending a very large deputation, and so were the Swiss, and were also giving a paper. The American Society had promised a paper on "The Latest Practice in Coke-Ovens in America." The French and Germans had not yet given any definite answer; and the German Association would probably not be able to send delegates, as they had had so much to do recently in the matter of congresses. A considerable number of papers had been promised—one by Professor Rottenbach, of Berne, on "Automatic Lighting and Extinguishing Apparatus." It was suggested that there might be another paper on the special lighting of the exhibition, which was very beautifully done, by other means than by electricity. He believed Mr. Beilby intended to give a paper; and he hoped to obtain one on the importance of Mond gas. Mr. Herring would read one on "Inclined Retorts;" and Mr. Charles Carpenter, of the South Metropolitan Gas Company, would also read one. In addition, Mr. Chester had very nearly promised a paper on "The Transport of Materials;" and Mr. George Livesey, the President of the Section, intended to read an Inaugural Address, on which he suggested, as a little innovation, that there might be a discussion, as he proposed making it suitable for the purpose. He (Mr. Helps) would be glad to answer questions which anyone wished to put; but he would venture to remind the members, with respect to the accommodation, that it would be a case of first come first served. The authorities in Glasgow were at present engaged in sending round the names of all members of the Section who intended to be present, and asking whether private individuals in the town would take them in. No doubt by this means they would obtain accommodation for a considerable number. With regard to the terms, of course everybody would pay for his own accommodation. He did not think hotel proprietors were at all inclined to offer any good terms to the Committee; and probably anyone writing to an hotel in Glasgow now would not have to pay any more than if he waited for the authorities themselves to obtain the accommodation. He would suggest, therefore, that any member who intended to go, and wished to make sure of getting ordinary room, to write himself, independently of the Committee; only he would ask any who did so to let him know, so that he could strike his name off—otherwise it would cause confusion. It was proposed that on the first day there should be the Presidential Address, and perhaps two papers, and in the afternoon a visit to the Dawsholm Gas-Works, and after that to the new works now being erected near Glasgow. On the second day, it was proposed that there should be a visit in the afternoon to one of the large gas products recovery works; and that on the third day nothing special should be arranged, as there would be so much to be seen in Glasgow itself and the Exhibition. It was suggested that, as several Continental gentlemen would be there, something might be done in the way of a dinner, to entertain them on one evening.

PLACE OF NEXT MEETING.

Mr. STELFOX proposed that the Institute meet next year at Southampton—a place which had most delightful surroundings, and would be eminently suitable on that occasion, as Mr. Durkin was President.

Mr. BOWER seconded the motion.

Mr. F. C. TAYLOR (Shanklin), in supporting the motion, said he was sure all his brethren in the Isle of Wight would be very pleased to hear of the decision.

The motion was carried unanimously.

Mr. DURKIN said he should be very pleased to see the members in Southampton, and his Directors, whom he had sounded on the subject, would give them a hearty welcome.

VOTES OF THANKS.

Mr. HEPWORTH proposed a vote of thanks to the gentlemen who had read papers, which, he said, had this year been of a very high quality.

Alderman MILES, in seconding the motion, said he regarded the readers of papers as almost the backbone of the Institute, and they ought to receive the warmest encouragement. Sometimes they might feel a little disheartened by the somewhat severe criticism passed upon them; but they knew it was always done good-humouredly.

The motion was unanimously passed.

On the motion of Mr. W. W. HUTCHINSON, seconded by Mr. T. CANNING (Newport), a vote of thanks was accorded to the Scrutineers.

Mr. J. BRADDOCK (Radcliffe) moved that the best thanks of the meeting be accorded to the Council for their services during the past year. He said their duties had been very onerous, involving a great deal of time and trouble; and they were fully entitled to the cordial thanks of the general body of members.

Mr. V. HUGHES (Smethwick) seconded the motion, which was carried unanimously.

Mr. ELLERY said the members had already had an opportunity of expressing their appreciation of the service the President had rendered in his address; but since then they had had further opportunities of seeing how much they were indebted to him for the manner in which he had conducted the meeting. He had done this with the greatest courtesy and consideration, which very greatly conduced to making the meetings agreeable; and he was sure they would all look back upon them with much pleasure. He therefore moved a hearty vote of thanks to the President.

Mr. R. HOOTON (Ashton-under-Lyne) seconded the motion, which was carried by acclamation.

The PRESIDENT thanked the members very sincerely for the way in which they had assisted him in conducting the meeting. He must acknowledge that on taking the chair on Tuesday morning, he was a little uncomfortable, having some rather unusual business to consider. But he felt that the members intended to do their best to make the meetings amicable and satisfactory; and when he found that this was so, his mind was very much relieved. They had not yet arrived at amalgamation; but he thought it was evident that unity was not impossible with honour on both sides. He hoped they would not have to wait very long before they arrived at this satisfactory result.

Mr. JONES proposed a vote of thanks to the Auditors, which was seconded by Mr. LEATHER, and carried unanimously.

Mr. D. T. LIVESEY (East Grinstead) proposed a vote of thanks to the Honorary Secretary (Mr. J. Davis) for his services during the past year; saying he thought if the readers of papers formed the backbone of the Institute, the Honorary Secretary must be the spinal chord.

Mr. DURKIN seconded the motion, and it was unanimously adopted.

Mr. DAVIS, in reply, said his duties were rendered very

easy by the zealous and able assistance of the Secretary, Mr. Dunn. But he highly appreciated the honour done him in re-electing him; and he should carry out the work of the Institute to the best of his ability.

Mr. SHADBOLT next proposed a vote of thanks to Mr. Dunn, and referred to the unusual amount of work which had fallen upon him during the past year, which he had discharged to the thorough satisfaction of all the members of the Council.

Mr. PORTER seconded the motion, and it was carried unanimously.

Mr. DUNN briefly acknowledged the vote of thanks, and the proceedings terminated.

THE LECTURE.

THE NEW TABLE PHOTOMETER AND PENTANE TEN-CANDLE LAMP.

By Professor FRANK CLOWES, D.Sc., Lond.

(Superintending Gas Examiner to the London County Council.)

1.—OFFICIAL GAS TESTING IN LONDON.

Members of the Institute are doubtless aware that the gas supplied to London is subjected to daily tests for purity and illuminating power. This examination is rendered compulsory by the City of London Gas Act of 1868. The gas examiners who carry out the tests are independent of the manufacturing companies. The tests are made in twenty-three properly-equipped stations, which are situated at various points of the districts covered by the gas supply, and are scattered over the County and City of London. The Corporation of London appoint the examiners to their three stations within the City boundaries, and the London County Council appoint the examiners to the twenty stations which lie within the County of London boundaries and outside the City proper. As a matter of convenience, the County Council also appoint a Superintending Gas Examiner.

The Act of Parliament under which this system of gas testing was established, further provided for the appointment of a body of three duly qualified Gas Referees. The duties of the Referees consist in the prescription and certification of the situation and number of the testing places, of the apparatus and materials used therein for testing the illuminating power, purity, and pressure of the gas supplied by the Companies, the mode to be adopted for testing and recording the illuminating power, purity, and pressure of the gas and the number of times of testing, and the maximum amount of impurity in each form with which the gas shall be allowed to be charged.

It is the exercise of one of the prescriptive duties of the Gas Referees which has furnished the subject of the present communication. In complying with the complimentary invitation of the Institute to deliver their annual lecture, I had to select a subject upon which to address the meeting of the members. It appeared to me that of the various matters connected with gas supply which came immediately within my experience, none could be more usefully treated of than the new form of photometer and the new standard pentane lamp which have recently been prescribed for use in the testing-stations by the Gas Referees. The Council of the Institute at once approved this choice of subject; and I hope that by furnishing a description of this apparatus and a full demonstration of its use, together with some statement of the experience derived from the use of the photometer and standard lamp in the County Council's numerous testing-stations, I shall be placing in the hands of the members of the Institute information of real utility and value.

2.—THE PENTANE TEN-CANDLE LAMP.

In prescribing the use of a standard source of light which dispensed with the employment of candles, the Gas Referees have undoubtedly conferred a benefit on those who have to determine the illuminating power of gas; and the Harcourt ten-candle pentane lamp seems, after six months' use in the County Council stations, to have proved itself to be a convenient and satisfactory substitute for the candles which were formerly used. The official descriptions of this lamp, and of the new form of photometer in connection with which it is employed, are published in the Notification of the Gas Referees, which may be purchased of the Government Stationers, or may be ordered through a bookseller.

It may be stated that the source of light in this lamp is the flame produced by burning, under suitable and definitely prescribed conditions, a stream of carburetted air. The carburetting liquid is the light petroleum, known under the chemical name of pentane. The preparation and properties of this liquid pentane are fully described by the Gas Referees in their Notification. Speaking generally, it is prepared by fractionating light American petroleum, and purifying the portion which distils over at 45°. The liquid can thus be readily obtained of constant quality, and

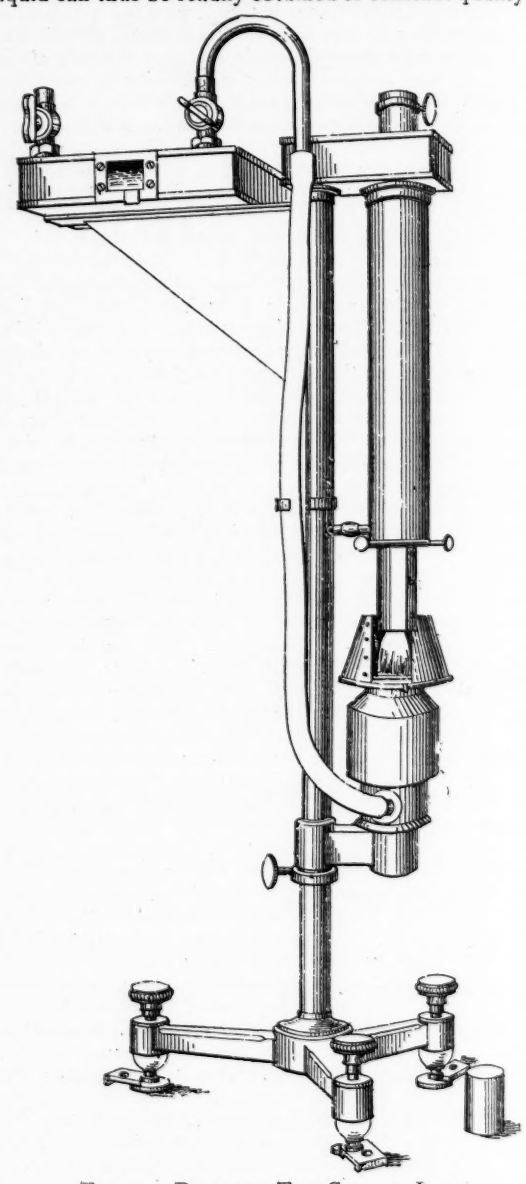


FIG. 1.—PENTANE TEN-CANDLE LAMP.

can be proved to be of suitable quality by the application of appropriate tests. This constancy in the character of the liquid is of prime necessity in insuring constancy of the standard light.

In order to understand the action of the lamp, it is necessary to bear in mind that the liquid pentane evaporates rapidly at ordinary atmospheric temperatures, and that the vapour which it produces is rather more than two-and-a-half times as heavy as atmospheric air. Accordingly, when the liquid is open to the air it is constantly evolving vapour, which, when it escapes, tends to fall rapidly in the air. This vapour can be poured and syphoned from one vessel to another like water; and it is actually by a syphoning action that the flame of the pentane burner is fed with the mixture of air and pentane vapour.

The diagram of the lamp (fig. 1) shows a pedestal and

upright tube, supporting by a lower arm a burner which is surmounted by a metal tube chimney, and supporting by an upper arm a flat, shallow, closed reservoir, which is partly filled with liquid pentane. This carburetting reservoir has two short vertical tubes in its cover, the passage of which can be controlled by taps. One of these tubes communicates, by means of a length of rubber tubing, with the steatite argand burner below; the other tube opens directly into the outer air. Owing to the high specific gravity of the pentane vapour, it is only necessary to open both the taps on the carburetter and to fill the rubber connecting tube with the vapour, in order to insure a constant feed of carburetted air to the burner. The heavy vapour, as it pours down the rubber tube, starts and maintains a syphoning action, which draws air into the carburetter and constantly draws the carburetted air down the rubber tube to feed the burner. The size of the flame is controlled by either of the taps on the top of the carburetter. The control is now usually applied to the air-tap, by an arrangement which is readily reached by the hand of the observer who is sitting at the further end of the photometer table.

Various means of adjustment are provided to bring the lamp under standard conditions. It is levelled by set-screws in the pedestal. The distance between the top of the burner and the base of the chimney is adjusted so as just to pass a standard box-wood block. The chimney is centred over the burner by means of three horizontal adjusting screws.

It should be mentioned that the central chimney is surrounded by a larger chimney, and that the current of heated air which is constantly passing up the interspace of the chimneys, while the lamp is burning, is drawn down the hollow pedestal tube by the action of the flame, and passes up as an inner air-feed to the interior of the ring-shaped flame. A similar heated air-current passes through an interconical space around the base of the flame, and is thus heated before it feeds the exterior of the flame.

When the lamp is to be used, the burner must be fixed at a standard height from the table, and the top of the flame must reach to a height indicated between two points of the chimney as seen through a talc window.

The residue of the liquid pentane should be emptied out of the carburetter once a month, when the lamp is in constant use.

As the name of the lamp implies, its flame has been shown to give under the prescribed conditions a constant illumination equal to that furnished by ten standard candles.

3.—The Table Photometer.

The different parts of this photometer stand on a firm table, convenient in height for the observer to take his readings while seated in a chair. The photometer depends upon the principle, which has been usually adopted in photometry, of bringing to equality the illumination of a suitable translucent screen by the standard flame and the illumination of the same screen by the gas-flame to be tested. The illumination of contiguous portions of the same screen by the burners from behind is seen by the observer sitting in front of the screen. Accordingly, both the flames are upon one side of the screen, and the observer is on the other side. The photometer differs, therefore, in its arrangement from the bar-photometers which were previously in use, since in these the burners were placed on *opposite* sides of the illuminated screen. But another essential difference from the older forms of photometer, which provided for one fixed and one travelling source of light, is that in the table photometer both sources of light are fixed in position at accurately measured distances from the observing screen. The equating of the illumination of the screen is brought about by adjusting the supply of the gas which is being tested to the Sugg "London" argand burner.

Accordingly, the procedure consists in placing the standard pentane lamp, the standard gas-burner, and the observing screen, at the fixed distances apart on the table—distances which are at once adjusted by means of standard gauge-rods. The pedestals of the pentane lamp, of the gas-burner, and of the photoped bearing the observing screen are then firmly clamped down upon the table. Their relative positions are shown on the plan of the table-top (fig. 2); and the actual distances by which they are separated are shown by dotted lines.

The gas to be tested is supplied to the argand burner through a meter, which stands near the observer and on his right hand. After leaving the meter, it traverses a pipe on its way to a balance-governor; and after its pressure has been thus regulated, it reaches the argand burner. In the course of the pipe which conveys the gas from the regulator to the burner, a specially constructed control-tap is interposed. This tap is controlled by a lever-arm the free end of which traverses a graduated metal arc. The tap is within convenient distance of the right hand of the observer, and enables him to adjust the supply of gas to the argand burner until the illumination from the gas-flame is equal to that from the pentane-burner as seen upon the screen.

As soon as this equality has been secured, the position of the lever-arm on the scale is noted down, and the time required for two complete revolutions of the meter, when gas is passing at this position of the lever, is ascertained in the ordinary way, by observation of the indicating hand of the meter against a stop-clock. By applying corrections for the temperature and pressure at the time of taking the reading, and either making a calculation or referring to the tabulated results of calculation, the illuminating power of the gas in standard candles may then be obtained.

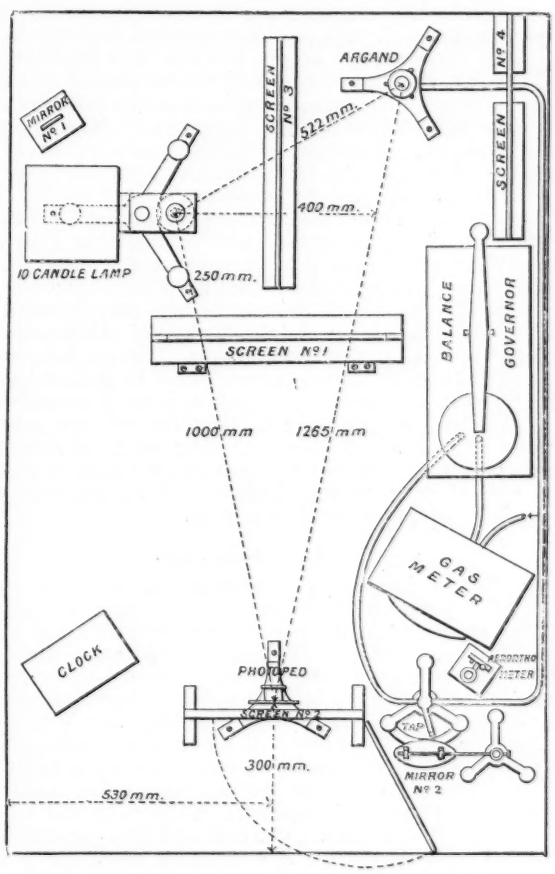


Fig. 2.—Plan of Table Photometer.

Such, in brief outline, is the principle of the new photometer and its method of use. As will be seen (fig. 2), there are various necessary or convenient accessories which have not been mentioned. Interference with the illumination of the screen by direct or reflected light, derived either indirectly from the two flames or from external sources, must be avoided. This is sufficiently prevented by hanging a black velvet screen at the end of the table opposite to the observer and behind the flames; by interposing opaque screens in suitable positions on the table; and by painting the table-top and all pieces of apparatus which stand upon it dead black. If these points are attended to, it has not been found necessary to employ a completely darkened room or to insist upon the walls of the room being painted black, but only to avoid the incidence of strong external light unequally upon the observing screen.

The screens which are used are the following: One is fixed directly between the two sources of light and the photoped, and is provided with openings for the transmission of light from each source upon the observing screen. This screen is made of wood painted dead black; and it may be hinged to the table so as to be folded down when

necessary. A second screen of black velvet is supported by a wooden frame close to the photoped, and between the observing screen and the observer's eye. It is provided with an opening through which the observing screen is seen. A swinging frame is attached to the same frame, and serves to shield the illuminated meter-face and lever-tap while the illumination of the screen is being observed and equalized. A third screen stands between the two sources of light, and a fourth shields the gas-burner from side draughts. A screen may also be placed between the water-reservoir of the governor and the gas-burner, in order to prevent the water from being heated by radiation. The entire surfaces of all these screens must be dead black; and the screens must be removable, or capable of being folded down, if they would interfere with the use of the standard rods for fixing the relative distances of the pentane-burner, the gas-burner, and the observing screen.

Two small mirrors are also placed in suitable positions on the table. One of these stands on a pedestal a little behind, and to the left of, the pentane burner, and is so placed and inclined that it enables the observer to see in it the reflection of the pentane flame by looking to the left of the photoped-screen. He can thus ascertain whether the flame is at the standard height, and can then adjust the height, if necessary, by turning with his left hand a screw, which, by means of a connecting thread, raises or lowers a cone over the air-inlet of the carburetter. The other mirror is convex. It stands on the observer's right, and serves to reflect light from the gas-burner upon the meter-face, the control-tap, and the note-book.

Three measuring-rods are provided for setting the burners and the photoped at the standard distances apart. One of these gives exactly 1 metre distance between the pentane-burner and the photoped with the observing screen; another gives 1·265 metres distance between the gas-burner and the observing screen; and the third gives a distance of 0·522 metre between the two burners. The gas-holes of the Sugg "London" argand burner should be periodically tested by means of standard wire gauges, in order to remove any obstruction, and in order to ascertain that the holes preserve their standard diameter. The diameter should be 0·045 inch. Each hole is accordingly tested with a 0·044-inch wire, which should pass down it, and with a 0·046 wire, which should refuse to pass.

4.—The Aërorthometer.

The Gas Referees also recommend as a means for quickly correcting the gas-volume for the temperature and pressure of the air, an instrument which they call an aërorthometer. The gas examiner is, however, at liberty to take the readings of a thermometer and of a barometer instead of employing the aërorthometer. The new instrument is practically a combination of a barometer with an air-thermometer. It consists of an inverted bulb-tube, the open end of which dips into a small mercury reservoir. The tube is graduated, and the numbers at the graduations represent the relative volumes of the bulb and tube down to the graduations. The bulb and tube contain air saturated with moisture. A companion tube, which is open to the air, dips into the same mercury reservoir.

The aërorthometer reading is taken by altering the capacity of the mercury reservoir by means of a pressure screw acting on the leather mercury reservoir, until the mercury is at the same level in both tubes. The number at the mercury level is then read upon the bulb-tube.

5.—The One-Twelfth Cubic Foot Measure.

A convenient glass measure which gives exactly one-twelfth of a cubic foot capacity is also prescribed by the Gas Referees. This is connected by a flexible tube with a reservoir of water, which can be raised or lowered on a suitable stand. The accuracy of the photometer meter can be tested by this measure. Each complete rotation of the meter-hand should correspond to one-twelfth of a cubic foot. Two complete rotations are observed, by forcing two successive twelfths of a cubic foot of gas from the vessel through the meter; and the meter is corrected, if necessary, by adjusting the quantity of water within.

6.—The Portable Photometer.

The apparatus already described was designed for use in the fixed testing-stations; and it has now gradually replaced the bar-photometers formerly in use in all the London stations. But the London County Council have undertaken also to make tests in different parts of the Metropolitan gas districts outside the fixed stations. For this purpose, they mainly utilize suitable rooms in various board schools.

It has been found that the table photometer requires little modification in order to adapt it to be conveyed on a cab to the points where such tests are to be undertaken. There has been no difficulty in having the table-top constructed so as to fold up by means of hinges; the legs and cross-stays of the table being rigidly attached by means of thumb-screws. The only other alteration which was requisite in order to bring the photometer into a portable form consisted in hinging some of the larger screens. The whole of the apparatus was then easily fitted into travelling cases. A flexible metal tube serves as a connection between the photometer and the source of gas supply.

Results of Daily Testings of the Gas Supplied by "B" Company to an Area in London for the Four Weeks ending Feb. 23, 1901.

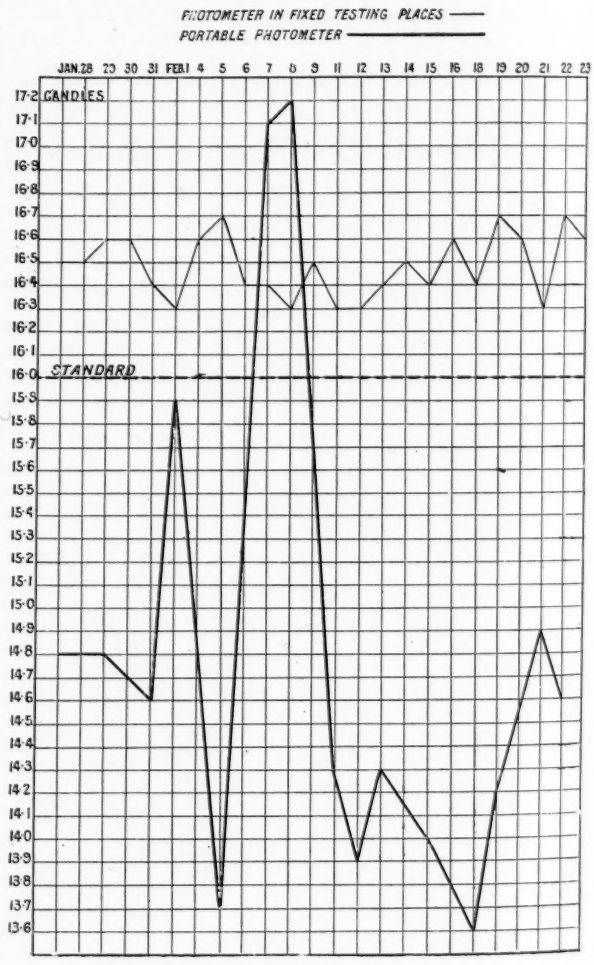


Fig. 3.

It has been found, by careful comparative tests, that the portable photometer, when it is used in rooms which are not fitted up as testing-stations, gives satisfactory results, provided that strong cross currents of air are avoided or screened off, and provided also that windows are protected by blinds. Ordinary gas-lights should be turned low; but their light does not disturb the readings, unless it is sufficiently intense to affect the sensitiveness of the observer's eye, or to differently affect the comparison on the observing screen. The blackening of the walls and ceiling of the observing room appears to be attended with no advantage. A lengthy experience of the use of the portable photometer entitles it to be recommended as a satisfactory and trustworthy means of ascertaining the illuminating value of the gas which is being supplied to the room in which the test is actually made.

7.—Results of Testings and Experience with the New Apparatus.

The new photometer and standard lamp have now been in use for some time in the fixed testing-stations and in different buildings in the area of the County of London.

The gas examiners who have constantly employed the new apparatus express a decided preference for it as compared with the bar photometer; and they have readily adapted themselves to the somewhat special manipulation and observation which it requires. No part of the apparatus has undergone serious modification, showing that the photometer had evidently been very carefully thought out and adapted by its designers. The aërorthometer has given trouble in some stations by leaking; and the examiners have in these stations fallen back upon taking the separate readings of the barometer and the thermometer. This defect can doubtless be remedied without difficulty, and may possibly be a fault in construction, and not in design.

A certain quality of translucent paper has been much preferred for the observing screen. This paper is now supplied and stocked in quantity, since the screen requires to be replaced as soon as it is soiled. The only check in the use of the apparatus has arisen from the passage through the regulating tap from the meter being occasionally choked by a drop of water. This apparently only arises when the bore of the tap has been made unduly small. The water is easily removed by taking out the plug of the tap.

In order to render the results, which have been obtained during six months by the fixed and by the portable photometers, easily visible and comparable, I have had them drawn out in curves (figs. 3 and 4). The three Companies whose gas supplies are examined under the Act of Parliament are indicated by the letters A, B, C. The daily results obtained during one month from the examination of the gas supplied by one Company are shown in fig. 3. The average weekly results obtained from the examination of the gas supplied in their districts by the three Companies are shown in fig. 4.

It will be seen by the curves that the supplies furnished by these Companies are under continuous examination in the fixed testing-stations, and that the results obtained by the testing of each of these supplies, therefore, form a continuous curve. The portable photometer, on the other hand, has been used successively for short periods in the districts of the different Companies; and therefore a broken record only, as regards any one special Company, is furnished.

Weekly Averages of Results of Testings with the Table Photometer from Oct. 6, 1900, to March 30, 1901.

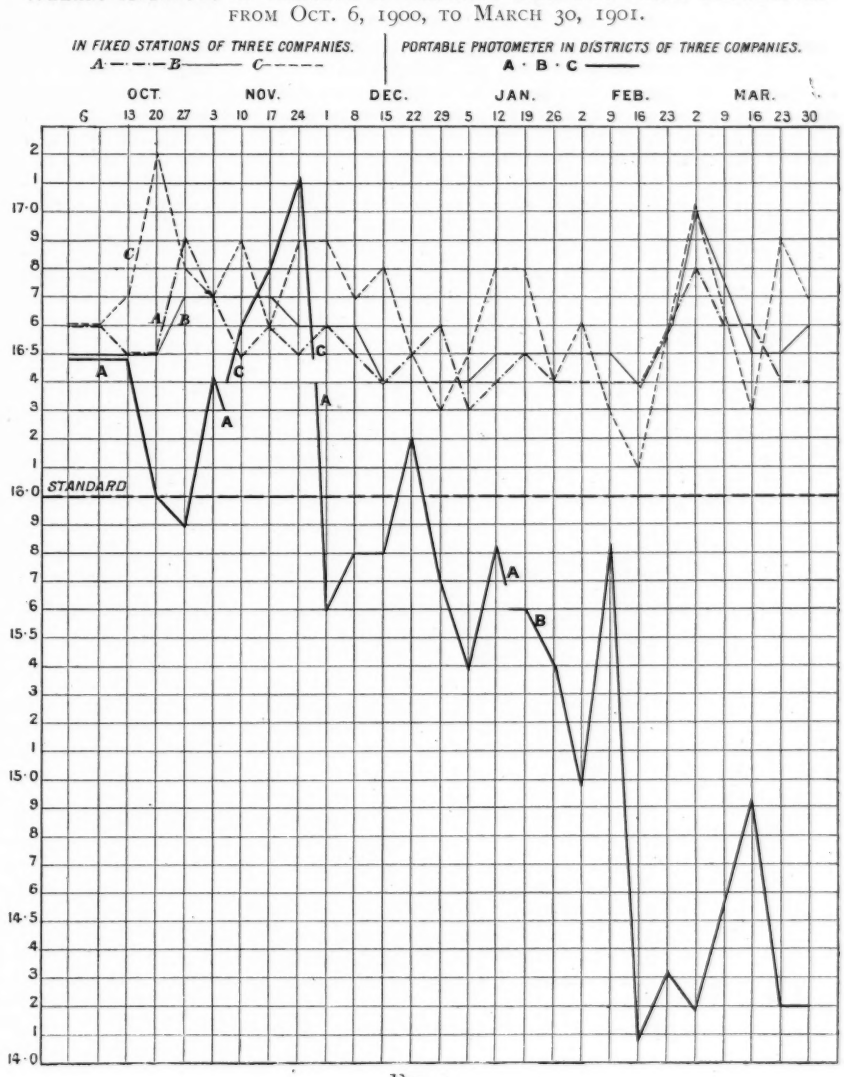


Fig. 4.

The statutory requirement is that gas of not less than 16-candle illuminating power shall be supplied to the fixed testing-stations; but no action can be taken under the statute unless the illuminating power falls below 15·5 candles.

A consideration of the diagrams shows that, as tested at the fixed testing-stations, the average illuminating power of the gas has not, during the periods shown, fallen below 16 candles, but has been uniformly maintained above that standard. In the case of one of the Companies, the gas tested outside the fixed testing-stations by the portable photometer was found to be at least equally satisfactory in illuminating power. But in the period under consideration, the other two Companies' supplies, as tested by the portable photometer in their districts, show illuminating power lower than the gas supplied to the fixed testing-stations in the same districts. In the case of one Company, this inferiority is very marked indeed, the average value being below 15 candles.

The results which have been obtained by the two methods of testing would seem to indicate that a reasonable agreement does not invariably exist between the quality of gas supplied to the fixed testing-station and to the district generally, and therefore that if proper attention is paid to obtaining fair conditions of testing—a matter of no difficulty with the new photometer—the illuminating quality of the gas supplied to consumers should be also tested by means of a travelling portable photometer. It is evidently possible to maintain a good and fairly uniform supply of gas throughout even a large Metropolitan district, since this is now being successfully accomplished by at least one of the Gas Companies; but it appears also to be possible to maintain a supply of gas of satisfactory quality to the fixed testing-stations while the consumers in the district around these stations are receiving gas of less satisfactory illuminating power.

By the kindness of the London County Council, I have been enabled to demonstrate the method of testing illuminating power on two of the Council's portable photometers; and I wish, in concluding, to acknowledge also the loan of the diagram of the lamp by Mr. Vernon Harcourt, and the trouble which Mr. Grimwood and Mr. Priest have taken in enabling members of the Institute to see tests actually carried out by the photometers in the meeting-room.

Mr. J. West, in proposing a vote of thanks to Dr. C lowes

said the question dealt with by him was a most important one, because it was by means of photometry that they measured and tested the commodity they sold, and they had to rely on the accuracy of these instruments for ascertaining its value. This subject had received a considerable amount of study and thought almost from time immemorial, especially by those who had made photometers, and by gentlemen like Mr. Vernon Harcourt and Dr. Clowes, who tried to devise a perfect instrument for the benefit of the gas industry. He (Mr. West) well remembered their old friend Mr. Hartley working with Mr. Vernon Harcourt about 25 years ago, and carrying out many experiments with the pentane lamp. He was much impressed with it then; but one thing he found, after making some experiments, was that it did not give the same value as 10 standard candles. The question was laid before Mr. Vernon Harcourt and the Committee appointed to consider the standard of light, and further experiments were made; and he believed Dr. Clowes would bear him out when he said that it was found ultimately that the lamp did not give the light of 10 candles. Further improvements were then made, and he believed there was now a perfect agreement between the gas companies and the authorities that the pentane lamp was a satisfactory instrument, and might usefully be adopted throughout the United Kingdom. One practical objection which he had to it in the old days was the difficulty that might be found in small works, where the managers had to make the pentane themselves; but there had been such advances since that time that they must, as a scientific industry, accept everything of a scientific character which had been proved to be of public utility. They were much indebted to Dr. Clowes, who, in 1896, gave them a very interesting lecture. They knew he was Chemist to the London County Council, previously to which he was Professor of Chemistry at Nottingham. But besides being associated with gas matters, he was much interested in studying other subjects which were of importance to the welfare of mankind—such, for instance, as the sewage question. He was a gentleman who, in every possible way, was endeavouring to work for the benefit of humanity; and he (Mr. West) had the greatest possible pleasure in proposing a hearty vote of thanks to him.

Mr. J. Stelfox, in seconding the proposition, said they were all familiar with the drawings of the pentane lamp, but many of them had not yet adopted it, and he was afraid some would still have to go on for the present in the old way. Still, they were much indebted to Dr. Clowes for the full and lucid explanation he had given of the photometer; and, personally, he felt under a great obligation to him.

The vote of thanks having been carried unanimously,

Dr. Clowes, in reply, said he had to thank the London County Council for the loan of the parts of the lamp, and Mr. Vernon Harcourt for the large diagram of the apparatus, and also a smaller one, to scale, showing various details. It was always a pleasure to him to do anything he could to help in such matters. For some fifteen or twenty years he had been teaching science, but always with a strong liking for its practical side; and he ever had the greatest sympathy with any body of gentlemen who were interested, as they were, in promoting such industries, and was only too happy to render them any service he could.

PAPERS READ.

WHY I ADOPTED WATER GAS.

By William Langford, of Longton.

During the last few years, many papers and articles have been written on carburetted water gas, and the various modes of manufacturing it. It is possible therefore that, in giving my experience, I may go over ground already traversed; but I hope at any rate to put forward a few suggestions and ideas which may prove beneficial to members of the Institute, who may some day be placed in circumstances similar to my own.

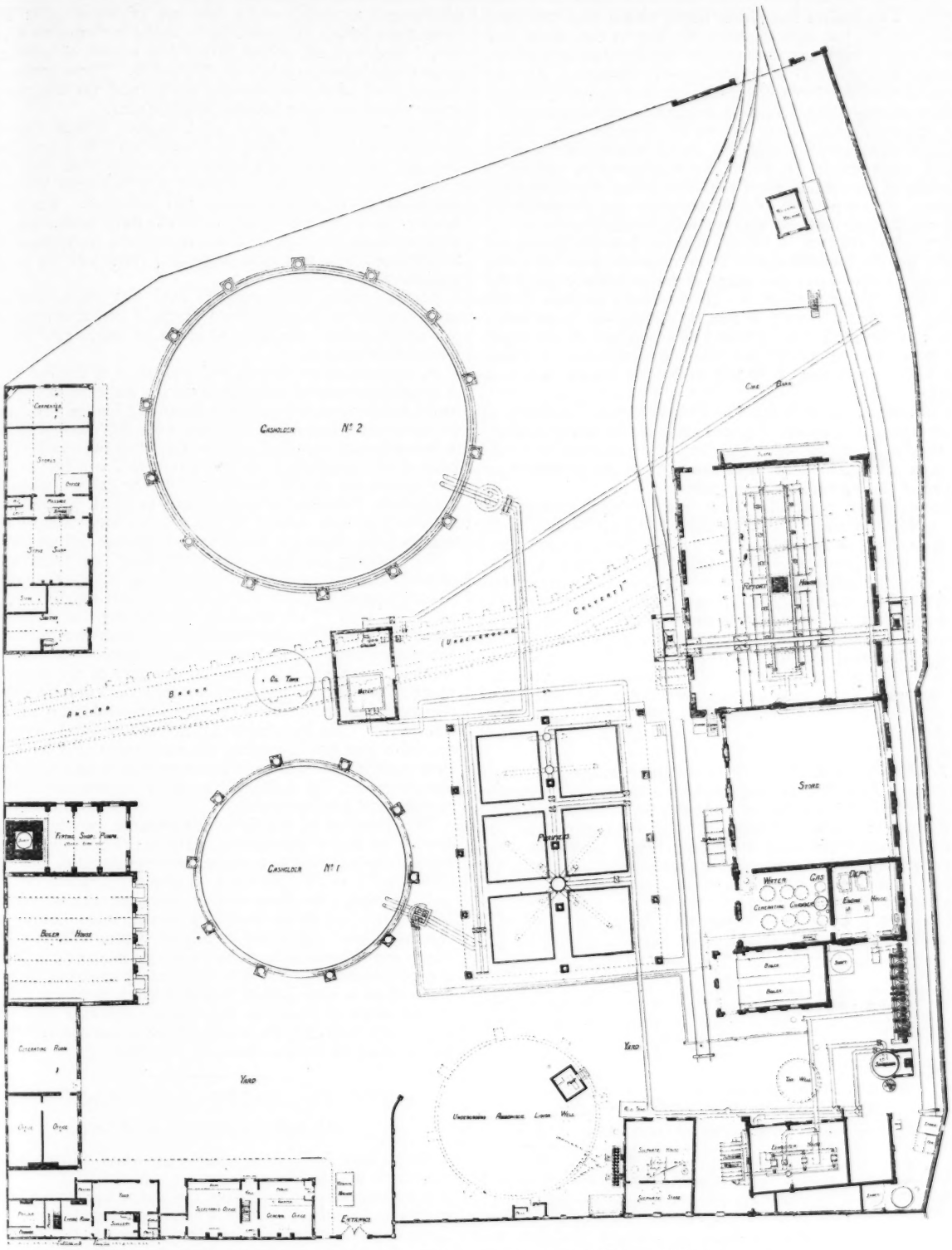
The make of gas at the Longton works, for the year ending July, 1899, was 131 million cubic feet; and the consumption for the following six months indicated an abnormal increase. The retort-house, shown on the plan, contained six beds of retorts, heated by regenerative settings, and worked by manual stoking-machinery. In view of the exceptional increased demand, it soon became evident that additional manufacturing plant would be required before the following winter; for, by December, some old beds of tottering retorts, which had been condemned as worn out and obsolete years before, had to be brought into action. The fuel used for heating these old retorts was about 45 per cent. of the coke produced, and the gas made per mouthpiece only 4200 cubic feet. Difficulty with coal and labour also began to cause anxiety; so that my first winter, with its very large increase in business, was not a season of unalloyed happiness, the average consumption for the first six months being 27 per cent. more than in the former year.

To meet the prospective demand, the most feasible plan at first appeared to be that of pulling down the old retort-house and rebuilding it as an extension of the present building. But it will be seen from the plan that there was no room for coke storage, without resorting to conveyors; and it was found impossible to rebuild and thoroughly equip a new retort-house in the time available.

Having had four years' experience with carburetted water-gas manufacture whilst assistant at Bath, the idea of a water-gas plant, in preference to a retort-house extension, came under consideration. I at once saw that a portion of the old retort-house, partitioned off, would make a good generating-house and engine-room; and as the site adjoined the new retort-house, no expense would be involved in the delivery of coke to the generators. The adjacent railway siding was convenient for oil delivery; a plentiful supply of water could be obtained free of cost; there would be very little difficulty in the disposal of the effluent from the separator; and the last and most important consideration of all was that the water-gas plant could be erected in time for the following winter. It was found that two generating sets, each capable of producing 300,000 cubic feet per day, would occupy only one-third the area of the old retort-house, 59 ft. 6 in. by 28 ft. 6 in.; while the other two-thirds would, by taking down the retort-stack, form a good coal-store of an area of 60 ft. by 60 ft.

To those members who have used carburetted water gas as an auxiliary to the retort-house, it will be obvious that, with the advantages mentioned, the decision should have been in favour of the water-gas plant scheme. Plans were at once prepared, and estimates obtained, for the work; the special condition being that the plant was to be completed and in operation by November, 1900. Contracts were entered into by February of that year, for the supply of two 300,000 sets, with duplicate oil and feed pumps, new boiler-house, two 27 ft. by 7 ft. Lancashire boilers, a steel storage tank to contain 52,000 gallons of oil, coke-lift, and a steel separator 20 ft. by 8 ft. by 6 ft. Messrs. Humphreys and Glasgow supplied and erected the plant. The boiler-house, boiler settings, masonry, and general foundation work were executed by a local firm; and our men did the work of laying the mains and connections.

Examination of Burners and Fittings.—Complaints of bad supply were numerous during the previous winter. I traced the cause, in very many cases, both in manufactories and private houses, to bad and worn-out burners, most of which had not been changed for years; and I recommended that a fitter should go round to all the consumers to inquire if the gas supply was satisfactory, and put on new burners, where necessary, free of cost. This was done last autumn. The fitter was given a daily list in a book ruled for the purpose, in which were entered the number of burners used, and remarks on state of fittings, &c. Some customers could scarcely believe that the interest taken free of cost was genuine; but the general result was so satisfactory that I hope in future to have this work done annually—not that the use of water gas renders it necessary. I have noticed no difference in this respect; but if the consumer is to obtain the full value for the gas paid for, it must be consumed under proper conditions. The burners used were special slit unions; governor burners being considered too expensive to adopt. In many towns, the public have been prejudiced against the introduction of carburetted water gas; and in starting the Longton plant, I thought it advisable to have the burners examined, so as to give the new gas a fair trial. It was also decided to light up and run the plant *privately* for some little time; and it was not until eight weeks after sending the gas out that the fact was made public, on the occasion of the visit of inspection to the works by the members of the Corporation.



Plan of the Longton Gas and Electric Light Works.

Operators.—It is advisable to have reserve men on the works who can take charge of the operating floor. I had four men and an office assistant fully instructed to start and work the plant. This afforded the opportunity of selecting the best men for the work, and provided relief in case of illness or labour trouble.

Mode of Working, and Notes on Machinery.—Through not having a separate and complete plant, the gas upon leaving the generating-house passes into a relief holder, and thence to the inlet of the exhausters, where it meets the coal gas. From this point, the mixed gases travel together through washers, scrubbers, and purifiers, to the station meter and gasholder. It will be seen from the plan that sufficient space has been left in the engine-room for the addition of separate exhausters; and I hope in the near future to have an entirely separate plant, including a new relief holder, because the present use of No. 1 involves too great a sacrifice of storage capacity. This is why the old inlet and outlet pipes are not disconnected, nor interfered with. The water-gas connections are therefore made on the inside of the existing inlet and outlet valves, as shown.

Engines.—In selecting engines for driving the fans, a high-speed self-lubricating type was chosen, working at 550 revolutions per minute, thus avoiding counter-shafting. These engines work splendidly, and occupy little space.

Steam Power.—A good and regular supply of dry steam, at a pressure of about 100 lbs. per square inch, is of the utmost importance for a water-gas plant. This involved having new boilers; and it was decided that they should be of sufficient power to provide steam for the whole of the

works. The boilers have been fitted with a high-pressure main (110 lbs. per square inch) leading to the water-gas plant, and a separate steam-main for the coal-gas plant, reduced to a pressure of 50 lbs. per square inch. By this means a double set of stokers was avoided; and, in case of sudden emergencies, steam is always available for water-gas requirements. The boilers are fitted with forced draught furnaces to permit the use of inferior fuel; and a steam recorder is fixed in the engine-room, giving a diagram of the variations of pressure during day and night. Boilers, steam piping, and connections are covered with non-conducting cement, and enamelled outside.

Generators.—There is an old saying that dividends are made in the retort-house. It is equally true that the success of the water-gas plant depends mainly upon the condition of the generator. If the lower portion of the lining be burnt away; if the clinkering be imperfectly done; if the clinker be allowed to creep up; if the depth of the fuel be neglected; or if there are variations in steam and blast pressures, it is impossible to obtain the best results.

Carburettor and Superheater.—The successful working of this portion of the plant depends upon the oil being properly sprayed over the top of the carburettor; and the maintenance of a uniform heat rests solely upon the proper regulation of the secondary air supply.

Blast.—The length of "blow" and "run" varies; but the general practice is four minutes for blowing and seven minutes for gas making. I have found that, by working at a high blast pressure of 19 or 20 inches, the time of blowing could be reduced to three minutes, and the daily output per set thus materially increased, without sacrificing efficiency. But to prolong the time of gas making means such an increase in carbonic acid, through the coke in the generator being cooled, that it is of no advantage to run beyond the seven minutes. As a check on the duration of runs and blows, also on the time taken in clinkering, I have found a cycle recorder fixed to the outlet of the generator a great advantage in giving a diagram for 24 hours' working.

Tests.—The following results are the average of a series of tests. The illuminating power was taken from a special service laid on from the relief holder to a bar photometer; the gas first passing through a small lime purifier. The tests for carbonic acid were also taken from the same supply; the lime purifier being bye-passed. Orsat's absorption apparatus was used for that purpose.

Illuminating Power.	Oil per 1000 Cubic Feet.	Carbonic Acid per Cent.	Candles per Gallon.	Coke Used in Generator.
Candles.	Gallons.			Lbs.
19·15	2·52	3·21	7·59	35·8

I am unable to give the exact cost of manufacture, as the plant in question is not a separate one; but the approximate cost of crude gas per 1000 cubic feet of 19·15 candles may be taken as follows:—

	d.
2·52 gallons of oil at 4¾d. per gallon	11·97
35·8 lbs. of coke, and (say) 10 lbs. for boilers = 45·8 lbs. at 9d. per cwt.	3·50
Wages, operator and attendant for coke and engines	0·75
	16·22

Making allowance for tar produced, the net cost of unpurified gas would be about 1s. 4d. per 1000 cubic feet.

Oil Tar.—This product is gradually becoming valuable. It is a good solvent for thick tar, and is therefore well adapted for periodically flushing out hydraulic mains containing it. It is also a good lubricant for exhausters, and is in demand for brick-making machinery. The great drawback to its market value as tar is the large percentage of water it contains; but a considerable proportion of the water can be eliminated by passing the tar through the hydraulic main before mixing with the coal tar.

Future Experiments.—I have recently been fully engaged with extensions of a different character; but it is my intention, as soon as possible, to run a crude water-gas main to the retort-stack, for the purpose of making experiments in mixing the water gas with coal gas, both in the hydraulic main and also by taking it into the retort mouthpieces—thus allowing the two gases to travel together to the hydraulic before condensation commences, in order that the water gas may have a better chance of picking up benzol.

Advantages Obtained.—The following are a few of the advantages experienced by the use of water gas: For some time before commencing to make carburetted water gas, I had noticed, when lifting the covers of purifiers, large naphthalene crystals on the inside. These gradually disappeared after commencing work; and the complaints from consumers have become less frequent.

During my first winter at Longton, labour troubles occurred with the stokers and cokemen. It is true that, through being short of gas manufacturing plant, the men had to work seven days a week, and therefore the conditions of life were monotonous and laborious. But since having the water-gas plant, the works have been closed for 12 hours each Sunday (with one exception) throughout last winter, and there has been a general improvement in the conduct of the men.

At Christmas, the supply of coal was short, when, to save expense of running from stock, a bed of retorts was put under a slow fire, and the make of water gas proportionately increased.

In manufacturing towns, and especially in the Potteries, it is no uncommon occurrence during autumn and winter to be suddenly enveloped in a dense fog, lasting sometimes for several days. At such times, an extra bed of retorts is immediately required and fired up, but the stock of gas runs short, pressures have to be reduced, and by the time the heat is up in the extra bed the fog has probably disappeared. The carburetted water-gas plant, however, can be brought into action in less than three hours; thus enabling the manager to welcome fogs and dull weather.

By making the water-gas plant bear the brunt of all emergencies in the demand for gas, the life of the retorts is lengthened, and the work in the retort-house is much more regular. For instance, having decided upon how many beds shall be used during the winter months, at the commencement of November that number is probably reached, after which it becomes the duty of the water-gas plant to provide for all additional requirements throughout the winter months. That is how I worked steadily through last winter. By November, all the winter hands were put on, there was less changing, the men knew that by doing their duty a winter's work at least was secure, and, as a natural result, the make of gas per ton of coal, and also per mouthpiece, has increased.

The question of which is the cheaper gas, is one that cannot be easily determined. By making a comparison, during the last twelve months, on equal ground, I have no doubt but that the manufacture of coal gas would be found to be cheaper; but there are indirect advantages—with the water-gas plant as an auxiliary to the retort-house—that cannot be well expressed in money value. These advantages are nevertheless unmistakably real, and conduce to a good balance-sheet. It is satisfactory to observe that the price of oil is now falling, and that there is also a decline in the price of coke; so that, unless the cost of coal be materially reduced, the introduction of carburetted water gas is likely to be considerably extended.

BRITISH WATER GAS PRACTICE.

By Robert Porter, of Elland.

Some four-and-a-half years ago, when addressing the members of the Manchester District Institution of Gas Engineers, as their President, the writer ventured a few remarks on the general policy of carburetted water-gas manufacture and supply. Briefly summarized, the estimates then given went to show a decided increase in the cost of manufacturing carburetted water gas as compared with the cost of coal-gas manufacture in that particular district, equal to 50 per cent. Of necessity, the bases of comparison, so far as carburetted water gas was concerned, were derived solely from the figures furnished by various writers prior to that date, and from working tests of comparatively short duration; while the coal-gas costs were derived from actual yearly workings.

The time that has elapsed since then should be sufficient, one would think, to allow of considerable development, and such as would enable us to define more clearly the position of carburetted water-gas manufacture, and the part it is destined to play in conjunction with its more ancient colleague; likewise the extent to which claims made on behalf of this "exotic" have been justified, or otherwise.

Little opportunity has been afforded the members of this Institute of thoroughly discussing the general policy of

carburetted water-gas manufacture and distribution; for the two contributions under this head, valuable as they were, did not furnish anything approaching the usual returns of twelve months' operations under every-day conditions. The first of these, by Mr. Stelfox, referred only to a first season's experience of carburetted water gas, and embraced but five experimental runs of a total duration of 9 days 12 hours 53 minutes; while the second, a lecture by Mr. Glasgow, dealt exclusively with the Departmental Committee's report, and was, of course, exempt from discussion and criticism. Under these circumstances, I feel little excuse is necessary for raising the question, and thereby providing an opportunity for a full and interesting discussion.

One other reason, however, may be adduced—viz., that water gas is at last expressing itself in the official Parliamentary Returns. Statistics of a more or less complete character are given in 1900, representing plant of over 100 million maximum day's capacity, producing 10,067,306,210 cubic feet, out of a total manufacture of 147,155,557,421 cubic feet, or 6·84 per cent. of the whole. It is here, if anywhere, we must look for the actual utility of carburetted water-gas manufacture as practised in this country.

Before dealing with these returns, it will perhaps be advisable to enumerate the principal claims put forth, and the items of cost of manufacture as generally given and accepted—such as that of (1) capital cost, which usually credits water-gas plant with a saving of at least 50 per cent., as compared with coal-gas plant; (2) the small floor space occupied; (3) the emergency quality; (4) ready control of illuminating power; (5) comparative independence of coal supplies; (6) practical control of the coke market, &c.

The chief items of working costs are generally taken as consisting of (1) oil at 7 candles per gallon; (2) coke at 45 lbs. per 1000 cubic feet, including boiler fuel; (3) labour; (4) purifying; (5) repairs and maintenance; (6) water; (7) management and supervision; (8) less residual tar.

From these items the cost of gas delivered into the holder is generally obtained, and may vary anywhere between 1s. and 2s. per 1000 cubic feet, according to price of oil and coke, local conditions of labour, &c., and quality of gas.

We can scarcely expect to abstract all these items from the official returns; but I venture to think that an analysis of those relating to carburetted water gas may have no inconsiderable bearing upon some of the more vital features.

Statement A tabulates the information abstracted therefrom with the addition of the nominal maximum day's capacity of the plant employed, and the percentage of efficiency obtained.

Unfortunately the water gas returns are not so complete as they might well have been; for of the returns from 48 undertakings giving the quantity of carburetted water gas made, only seven state the quantity of coke used. There is sufficient, however, to enable us to obtain an average of the coke used over a portion of the undertakings, but not so satisfactory as it would have been had it extended over the whole.

For convenience, I have separately tabulated the coke returns:—

Statement B.

Showing the Gas Made and Coke Used in the Seven Undertakings.

Town.	Make.	Coke Used. Tons.
No. 1	25,286,500	618
21	17,916,100	418
22	292,878,000	5,616
32	95,875,000	2,104
38	141,118,000	3,738
43	71,277,000	1,319
46	146,849,000	5,697
Total	791,199,600	19,510
		55·23 lbs.

Reverting to Statement A, the most striking feature is undoubtedly the small annual make shown per unit of daily capacity of plant employed. One of the chief claims of carburetted water gas advocates has hitherto been the low capital cost; this claim being based upon the assumption that, like coal-gas plant, it was to be employed to the extent of 200 maximum days per annum. The abstract, however, proves how delusive this notion has been.

If we now take the maximum day's capacity of the plant employed—amounting to 104,045,000 cubic feet—and apply the coal gas multiplier of 200 days, we should expect an annual make of 20,809,000,000 cubic feet, whereas the returns actually show a total annual make of 10,067,306,210 cubic feet, or 48·37 per cent. only of that evidently anticipated by those adopting its use. A closer perusal of Statement A will disclose the fact that, although the annual make per unit of daily capacity varies greatly, not in one instance (even in the case of those who have possessed and worked the plant for some considerable time) does the result approximate to general expectations; indeed some notable instances are even below the average. This may be a rude shock to those who have plumed themselves upon the capital saving effected; nevertheless it is clearly a statement of fact in regard to carburetted water gas practice in these Isles.

Let us then endeavour, in the light of this revelation, to gauge the extent of the saving on capital outlay, if any. In the first place, the item of gas storage must be omitted in both instances. There may, or may not, be a saving under this head; but, speaking from observation, the introduction of carburetted water-gas plant would appear to have little, if any, effect by way of reducing holder capacity, when at the best. Holders could not be abolished; and even assuming the entire manufacture of water gas, it is questionable whether the same storage would not be found necessary as in the case of coal gas.

This being such an open question, we will confine ourselves to the plant itself as far as the holder inlets, omitting such variable items as workshops, dwellings, offices, &c. On this basis, and providing for a plant of a nominal maximum day's capacity of 1,000,000 cubic feet, the cost of a coal-gas plant would not exceed the figures in Statement C.

Statement A.

Showing the Daily Plant Capacity (in Thousands), Yearly Make, Oil Used (in Gallons), Coke Used (in Tons), and Percentage of Efficiency Obtained.

No	Daily Plant Capacity.	Yearly Make.	Oil Used.	Coke Used.	Percentage of Efficiency Obtained.
	Thousands.	Cubic Feet.	Gallons.	Tons.	
1	500	25,286,500	89,545	618	25·28
2	125	1,122,200	5,365	..	4·48
3	150	5,132,000	15,439	..	17·10
4	3,000	300,000,000	1,116,351	..	50·00
5	200	11,135,700	32,700	..	27·83
6	600	20,237,000	58,000	..	16·86
7	700	45,490,000	161,367	..	32·49
8	700	48,608,000	213,790	..	34·72
9	750	66,064 000	702,862	..	44·04
10	225	18,000,000	27,929	..	40·00
11	700	51,833,000	182,147	..	37·02
12	8,000	730,518,000	2,645,929	..	45·65
13	1,400	105,170,600	313,094	..	37·56
14	4,950	873,214,000	3,097,044	..	88·20
15	2,000	8,824,000	39,637	..	2·20
16	22,500	2,965,564,000	9,094,842	..	65·90
17	1,800	18,649,000	59,700	..	5·18
18	3,600	447,495,000	1,323,336	..	62·15
19	300	8,467,000	28,313	..	14·11
20	700	126,440,000	392,374	..	90·31
21	150	17,916,100	59,073	418	59·72
22	1,850	292,878,000	1,026,929	5,616	79·15
23	1,000	150,989,900	429,282	..	75·49
24	1,000	108,071,000	304,888	..	54·03
25	225	19.952,000	60,480	..	44·33
26	1,875	211,189,000	583,533	..	56·31
27	150	11,923,000	36,740	..	39·74
28	225	7,270,000	20,513	..	16·15
29	350	20,905,000	65,164	..	29·86
30	150	10,847,200	42,323	..	36·15
31	5,600	208,000,000	687,042	..	18·57
32	750	95,875,000	269.225	2,104	63·91
33	150	5,950,000	19,641	..	19·83
34	120	16,838,200	46,365	..	70·15
35	150	18,570,000	47,040	..	61·90
36	800	32,463,600	98,317	..	20·28
37	1,500	14,310,000	46,345	..	4·77
38	2,250	141,118,000	409,641	3,738	31·35
39	1,200	146,724,000	529,270	..	61·13
40	500	33,909,210	115,095	..	33·90
41	1,250	110,920,000	273,031	..	44·36
42	7,000	564,661,000	2,122,163	..	40·33
43	750	71,277,000	445,511	1,319	47 51
44	11,500	873.973,000	2,296,748	..	37·99
45	1,200	90,971,000	333,497	.	37·90
46	1,250	146,849,000	445,208	5,697	58·73
47	2,000	211,652,000	809,387	..	52·91
48	6,200	554,054,000	1,886,589	..	41·68
Total	104,245	10,067,306,210	33,108,804	19,510	48·37 Average.
			3·28 galls.		

STATEMENT C.

Capital Cost per Million Cubic Feet per Diem, Coal-Gas Plant.

Retort-house and coal-stores	£4,000
Inclined Settings with Fittings, &c., all complete (with 25 per cent. reserve)	13,000
Exhausting machinery (in duplicate)	700
Exhauster-house	400
Condensers	600
Scrubbing plant	1,700
Purifying-house and plant	6,000
Station meter and house	700
Tar well and tank	500
„ pumps, &c.	150
Boilers (in duplicate)	600
„ house	250
Total	£28,600

In comparison with the foregoing, a fully equipped carburetted water-gas plant of the same capacity would, at current prices, cost £15,000, and consist of: Two sets of generators of 500,000 cubic feet each maximum day's capacity; washers, scrubbers, settling tanks, relief holder, boilers, chimney, engines, blowers, exhausting machinery, circulating pumps, oil pumps, station meter, purifiers, buildings, and oil storage tanks, with all pipes, connections, and incidentals. This comparison shows a nominal difference in first cost of £13,600 in favour of water gas, or an increased cost for coal-gas plant of 47·55 per cent.

Remembering that, in practice, water-gas plant of a given maximum day's capacity yields only 48·37 per cent. of the annual duty obtainable from coal-gas plant of equal size, it necessarily follows that, to compare on the basis of annual make, the capital outlay on the former must be increased to a corresponding extent. Thus £15,000, the nominal cost, must be multiplied by 2·0674, which yields £31,010, as against £28,600 as shown in Statement C.

This actually reverses the order—showing an increase of £2410, or 8·42 per cent., against water gas; or to estimate downwards to the lower duty, a coal-gas plant of 483,000 maximum day's capacity would suffice, costing £13,833, against £15,000, a difference of £1167, or 8·42 per cent. as before. The item of ground-space occupied is to a great extent debatable. Possibly there is some gain in this direction; but certainly it is not so great as is sometimes claimed. It is no unusual thing to be told of the small space occupied by the oil-tanks, containing so many weeks' or months' supply; the yard-room taken up by the complementary coke-stack being at the same time utterly ignored. If due allowance for coke storage be made, one-third the space occupied by coal-gas plant per given nominal capacity will be found a generous estimate. When this is multiplied by 2·0674, to ensure a given yearly output, the saving in ground-space becomes, it appears to me, a negligible quantity.

To revert to our statements. The oil consumption is the only item that may be considered thoroughly satisfactory, and within the claims originally made; for an average consumption of 3·28 gallons per 1000 cubic feet, over 48 undertakings, is most creditable.

We have no means of ascertaining the average illuminating power of the gas here represented; but assuming it to have been used for enriching purposes to any material extent, these figures certainly represent the minimum of waste. Doubtless this most costly item has been subjected to the strictest supervision; for at prevailing prices 1d. or 2d. per 1000 cubic feet may easily be added to the cost by indifferent treatment.

Further, this is probably an indication of more complete purification than was at one time deemed necessary, when partisans talked lightly of making good a loss of two candles, due to the carbonic acid, by the use of a little more oil, as upwards of one-third of a gallon would be utilized for this purpose, costing at recent prices some 2d. per 1000 cubic feet. But whatever the causes that have contributed to this result, carburetted water gas would stand better to-day had all other claims been equally well maintained.

Next to low annual producing efficiency, the coke consumption is the most unsatisfactory feature—averaging, as shown in Statement B, 55·23 lbs. per 1000 cubic feet made. Whether this figure includes boiler fuel in every case, is uncertain. Be that as it may, this is the average of a year's operations, and adds 1d. per 1000 feet to the working cost, when compared with the 45 lbs. inclusive, usually claimed. Moreover, assuming an available yield of 9 cwt. of coke per ton of coal carbonized, this increased rate of consumption reduces the total quantity of gas procurable per ton of coal by 4000 cubic feet.

The emergency quality is naturally one that has been made much of; but conditions of supply existing in this country would appear to minimize this feature. Where the maximum proportion of water gas to coal gas is 25, or even 30 per cent., and that only of the gas sent out in the daytime—and this is the practice in some instances—its degree of utility must be greatly curtailed. Indeed, it bears a great resemblance to the muzzling of a good watch-dog.

The ready control of the illuminating power is likewise a notable feature, and is doubtless most effective so far as the water gas itself is concerned. But when the proportion of this gas is reduced, or entirely omitted, during the hours of darkness, this factor is also rendered non-efficient to a very great extent.

The comparative independence of coal supplies—meaning, one would suppose, a temporary cessation of deliveries—is likewise minimized by the foregoing factors; also as, in anticipation of the auxiliary services of water gas, a smaller quantity of coal would be contracted for than would otherwise be the case. Further, the existing adjustment of air supplies to all atmospheric burners, and to gas-engines, creates an arbitrary limit, which, if exceeded, would defeat its own ends by rendering the gas useless. Under these conditions, it is questionable whether half the coke produced could actually be utilized.

The practical control of the coke market is possibly one of the most fascinating claims put forth; and, provided that the production of water gas be of secondary consideration, it would certainly prove a most effective weapon in this respect. In practice, however, it would seem that a certain total quantity of coke is kept off the market, but not necessarily at the time most suited to the control of prices. Estimating from Statements A and B, the quantity of coke removed, and not produced, would be some 700,000 tons. Should this quantity appreciably affect the coke market, it will result in opening the door to other fuels, and thereby operate to our eventual detriment as coke-sellers.

Respecting the working costs, oil and coke consumptions have already been dealt with. The labour item is necessarily a variable one, according to locality.

Purification, as pointed out when dealing with the oil consumption, is most scrupulously effected; the results, according to figures recently published of three years' working, giving an average of 1·50d. per 1000 cubic feet, or three times the amount originally estimated.

On the other hand, repairs and maintenance, and water consumption, have evidently kept within the limits originally fixed, amounting to about 0·50d. and 0·10d. per 1000 cubic feet respectively.

Management and supervision are items generally estimated from coal-gas practice; but this I think is scarcely correct, for however careful the operators may be, a much closer scrutiny of the illuminating power and carbonic acid must be exercised. At any rate, 0·50d. per 1000 feet is a sufficiently low figure for these items.

We will now compile from the foregoing statements and deductions, two estimates of the cost of manufacture—the first, as representing the claims made in the earlier stages; and the second, the working cost in actual practice to-day. Each of these estimates includes capital charges—the one on the assumed yearly efficiency, and the other on the actual yearly efficiency. These, by the way, will compare with coal gas capital costs, as per Statement C, £28,600 at 5 per cent. = £1430 ÷ 200,000 = 1·71d. per 1000 feet made.

STATEMENT D.

Working, &c., Costs per 1000 Cubic Feet as Claimed.

	Pence.
Oil = 3·28 gallons, at 2·50d.	8·20
Coke = 45 lbs., at 12s. per ton.	2·89
Labour	0·69
Purifying	0·50
Repairs and maintenance	0·50
Water	0·10
	12·88
Less residual tar	0·63
	12·25
Capital charge on 1,000,000 cubic feet per day plant basis, £15,000, at 5 per cent. = £750 ÷ 200,000.	0·90
Total cost	13·15

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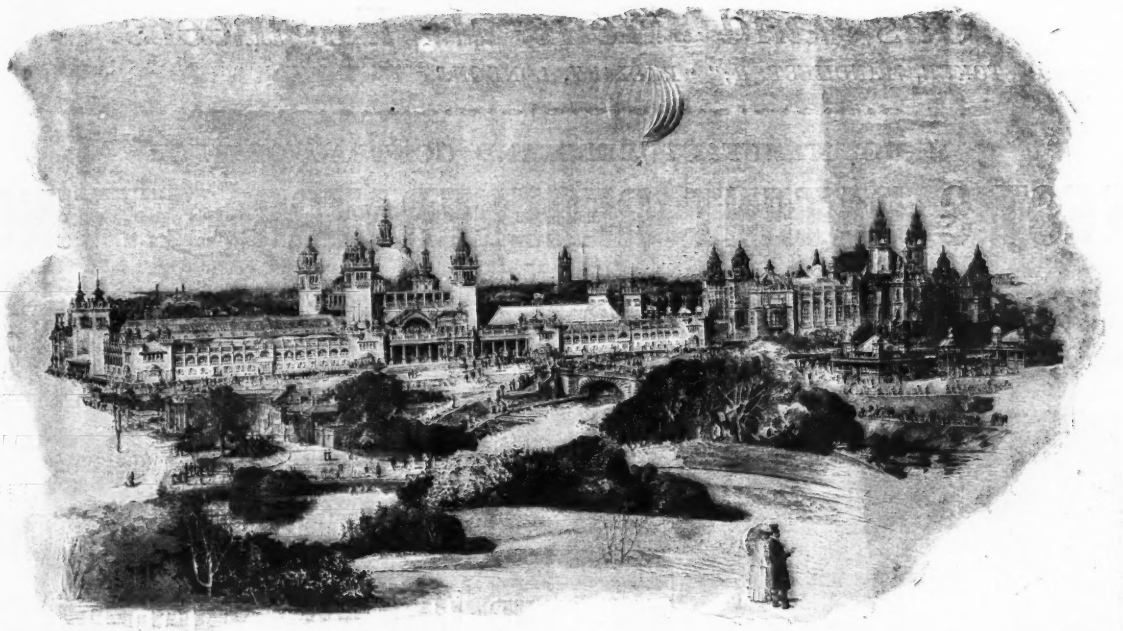

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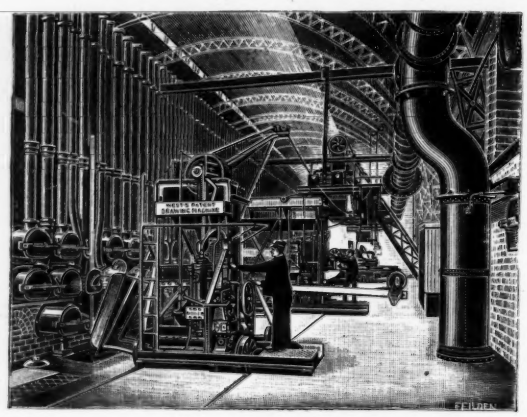

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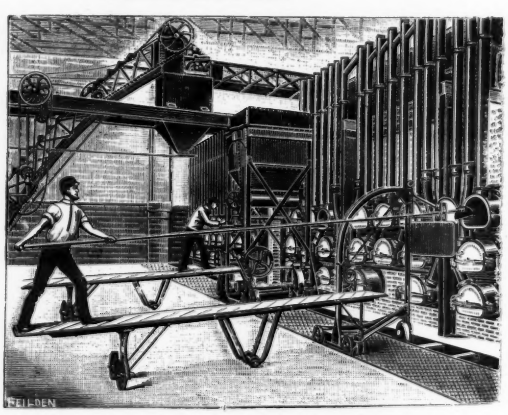

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Working, &c., Costs per 1000 Cubic Feet in Practice.

	Pence.
Oil = 3·28 gallons, at 4d.	13·12
Coke = 55·23 lbs., at 12s. per ton	3·55
Labour (15 per cent. allowance for stand-by)	0·80
Purifying	1·50
Repairs and maintenance	0·50
Water	0·10
Management and supervision	0·50
	20·07
Less residual tar	0·63
	19·44
Capital charge on annual output basis, £15,000 × 2·0674 = £31,010, at 5 per cent. = £1550 ÷ 200,000	1·86
Total cost	21·30

Comparison.

Cost as claimed	13·15d.	
„ in practice	21·30d.	
Difference	8·15d.,	or 61·21 per cent.

Thus we see—avoiding extreme prices for oil, &c.—an increase in the cost of manufacturing carburetted water gas in actual practice, of (say) 60 per cent. over that anticipated by the pioneers. During the past year, the difference must have been still greater. This conclusion has not been arrived at by any haphazard method, but by careful inquiry and observation; and the writer ventures to think it is as near the truth as it is possible to arrive in a general statement embracing the whole country.

Contemplation prompts the query, Why this difference? and to a great extent it has so far been the author's endeavour to answer the question. Briefly, the conditions of supply are such as to hedge about the use of carburetted water gas with such reservations as to greatly impair its commercial efficiency; and conflicting claims have militated against the realization of all. In short, it has not been acclimatized according to expectations. "You cannot eat your cake and have it," is an old Yorkshire saying; neither can you, for instance, expect to utilize a mere standby plant to the utmost of its capacity, particularly when its sphere of usefulness is minimized by natural restrictions.

The exact position of carburetted water gas in British gas practice is now readily determined. Its proportion to the entire output for 1899 was 6·84 per cent., as previously stated. The total maximum day's capacity of plant erected to the end of 1900, is, according to the "Gas World Year-Book," 134,570,000 cubic feet; and on the same yearly efficiency basis as 1899 will, when in full use, increase this figure by 2—making it 8·84 per cent. of the whole. That it will continue to increase a little further may be conceded; but in the writer's opinion 10 per cent. is the full proportion to which it may be expected to attain. In the guise of an auxiliary, it made its appearance; and the results of its use would indicate that in no other capacity is it likely to be of service.

Carburetted water gas has undoubtedly set an example, if only as a warning against indiscriminate expenditure upon new departures of questionable efficiency. It has served a purpose as a set-off against a rising cannel market, where used as an enricher, although even here it is merely an alternative method of utilizing oil for gas enrichment. On the other hand, it has assisted to tide over difficulties that should not have been permitted to exist; has been instrumental in putting off the evil day; and has eventually added to the burden it was intended to alleviate. Indeed, it is not improbable that after reaching the summit of output (say, 10 per cent.), we shall witness a decline, until high illuminating power giving way before low-grade gas, or luminosity to heating value, it will partially if not wholly become extinct. Introduced into an atmosphere unsuited to its constitution, it has flourished with a certain degree of artificial vigour, which can but end in rapid dissolution and early decay.

Discussion.

Mr. J. Stelfox (Belfast) thought there was a great deal to be said with reference to the two papers just read. Mr. Langford's was an interesting experience that might be of use to those who had not yet thought of utilizing water gas, and it contained one or two questions which he was glad to see—such as that relating to the indication of pressure. The only point to which he need refer was as to the relief holder. If Mr. Langford had only two holders, he (Mr. Stelfox) could understand that he would not like to be left with one for the town supply; otherwise he did not see that there was any loss of storage capacity. In the existing plant at Belfast, he started with a 100-feet holder, and kept it as a relief holder. If at any time the stock went up, they simply filled it to the top, and stopped the plant. With them, it did not mean the loss of a single cubic foot of storage. He should be sorry to criticize the working of any particular place without knowing the circumstances. Mr. Langford had taken 4¾d. per gallon for the oil, which he did not consider a normal price. It was not comparable with figures to which he was accustomed; and he thought it was too high. Mr. Langford did not put down anything for purification; he (Mr. Stelfox) did not know whether this was because he adopted purification simply by oxide. One of the advantages of water gas, by which the coal-gas plant was greatly assisted, was that there were times in the winter when the beds were not required to be laid by for short periods of work. In the past year, the last of their coal-gas retorts was set alight early in October, and no change was made in the number at work until the middle of March. All the irregularities and buffetings of the season were taken up by the water-gas plant. This, and other collateral advantages obtained by the coal-gas plant, did not seem to be thought of by those who put down water gas at just the cost per 1000 cubic feet which might appear in the returns. With regard to Mr. Porter's paper, he confessed he felt a little surprised at his selecting this subject, because, as a rule, when about to present a paper, one liked to give something from actual experience, and not from hearsay or inquiry. Of course, he had no objection to Mr. Porter taking any course he liked; but, naturally, a good many things appeared in the paper at which he (Mr. Stelfox) was surprised. It was clear enough to him that the investigation had not been sufficiently close. It seemed that Mr. Porter had been for some time trying to forge a thunderbolt; and, from his point of view, it seemed to be a display of very harmless sheet-lightning. There were a number of things to which he took exception; but he could only refer to one or two. In the first place, he entirely objected to his principle of multiplying the capital account by 2 because they were not using the plant to the full extent. They might some day do so. In certain cases it might be said, on the same ground, that gas-plant cost twice as much as it appeared to cost. In his own case, there were two things which prevented his using the plant to a much greater extent than he had done. In the first place, on the side where he had the largest producing plant he had the smallest purifying capacity; so that he only used three sets out of four, and these three only occasionally, simply because he could not put any more gas through the purifiers. But this had nothing to do with the efficiency of the plant. To find in that a reason for multiplying the cost by 2·0674 was altogether out of the question. Another reason was that many people paid strict attention to the supposed requirements of the Board of Trade. As far as they in Belfast were concerned, they had sometimes exceeded them. He had sent out as much as 60 per cent. of water gas in the whole bulk, and had then been able to overcome difficulties which no reasonable amount of surplus gas-holder storage would avoid. It appeared to him that Mr. Porter's argument was something like this: He went into a shop and bought an umbrella, and paid £1 for it; but as he could only use it for half the days of the year, therefore he had paid £2 for it. He (Mr. Stelfox) did not think such a contention was worth consideration. He was glad to see Mr. Porter had found one thing to which he had no objection, and he was pleased to know that people got through with 3·28 gallons of oil per 1000 cubic feet; but the question of illuminating power was often lost sight of. The price per 1000 cubic feet was put down; and it seemed to be forgotten that one price was for 15, and the other for 21 or 22 candle gas. In this way they were helping the coal gas in all places where the standard power was 16 or 17 candles, and they got no credit for it. The use of oil at Belfast during the past year was 2·77 gallons per 1000 cubic feet. As an example of the easy way in which Mr. Porter had put on the costs, he would refer to the paragraph in the paper dealing with management and supervision—items which the author said were generally estimated from coal-gas practice. But this, he thought, was scarcely accurate; for, however careful the operators might be, very much closer scrutiny

of the illuminating power and of the carbonic acid must be exercised. At any rate, ½d. per 1000 cubic feet was a sufficiently low figure for these items. He did not see why Mr. Porter should not have put on 1d. just as much as ½d., for those who worked with water gas knew that it required no more, but, if anything, a great deal less supervision; so that there should really be a set-off on the other side. He might say that this item of ½d. per 1000 cubic feet would simply mean, in his case, £1250 a year for extra supervision which did not occur. The oil was taken at 4d. per gallon, which Mr. Porter seemed to think was normal. He (Mr. Stelfox) paid 4¾d. for the last parcel they had received; and though things were a little different now, he did not consider 4d. a fair figure, unless he was going to compare it with coal gas made with coal at the recent high price. Then, of course, the two were on all-fours. With regard to the question of space, any attempt to show that there was such a saving was like arguing with a man who said the sun was not shining. One did not know where to commence. In his own case, he had an old retort-house containing three benches all crowded up, and scarcely room to work. They took one bench out, and in about three-fourths of the space occupied by a bench which would not make 9000 cubic feet of coal gas they put in four plants, each of which produced 1,100,000 cubic feet a day, or 3,500,000 cubic feet when fully worked. In that house, supposing legal restrictions did not come into force, he saw his way, with ample room, to put in producing plant equal to 16 million cubic feet. With reference to coke, Mr. Porter said they should be charged something for rent for a place to dump the coke in. If anybody went into their works, they would see a heap of coke which they were only too glad to get rid of, because they were being choked up. But the water-gas plant was eating into it; and, instead of charging for rent, they were actually providing space for storage, and what was taken out was simply used over again. These things were so self-evident that one really could not argue about them. In regard to purification, he was the partisan, he believed, who considered that water gas purified by oxide would repay for the passing on of carbonic acid by the use of a little addition of oil for the loss of illuminating power; and at the present moment he was prepared to suggest this. Though, with the high price of oil, it did not show so distinctly as when it was lower, still he was of the same opinion. If they purified with iron, the carbonic acid sometimes got up a little, and the purifiers came over quickly. He was sorry he did not come prepared with any particulars of his last year's working, but he was not aware of the nature of the paper that was going to be read. A number of figures were given in it, but the main point made was with reference to the coke used per 1000 cubic feet of gas. Nothing more outrageous could he imagine than the fact of taking the returns given in seven cases only out of some 48; and really, over the country, there were more than 80. He had been favoured with an advance copy of the paper on the previous night, and had looked into the seven cases, and taken them singly as quoted. No. 1 represented the use of approximately 54 lbs. of coke, dropping the fractions, as they need not go into four places of decimals for this matter. No. 21 on the list showed 52 lbs.; No. 22, 43 lbs.; No. 32, 49 lbs.; No. 38, 59 lbs.; No. 43, 41 lbs.; and No. 46, 87 lbs. Now, with these seven towns, Mr. Porter had chosen to found a charge against the whole water-gas industry, by making it appear that they were using 55 lbs. of coke per 1000 cubic feet, when there was a variation so great as from 41 lbs. in one case to 87 lbs. in another. He (Mr. Stelfox) forgot what eminent man it was who spoke of different classes of falsehoods as, first, lies; second, blank lies; third, statistics. He was quite sure Mr. Porter had made these quotations in perfect good faith; but he was not perfectly acquainted with the subject, and should have made further inquiry before censuring the whole industry for the use of 55 lbs. of coke when he found that in these seven cases it varied from 41 lbs. to 87 lbs. Surely they had a right to assume if one man could work with 41 lbs. another could do so. At Belfast they managed with 41 lbs. or less, though through the whole season they kept spare plant always ready to pick up emergencies, and therefore burnt a little more coke than they would have done if they had tested it by a single-plant working. This was a sample of what underlay the whole structure of the paper; and it was the one point on which the author was most severe. Coming back to the space occupied by the coke, he (Mr. Stelfox) contended that they should not be charged anything for space, but should rather be paid a premium for removing the coke from the coal-gas plant. He did not question the items of expenditure, which were perhaps based favourably for the coal gas; but, considering what could be done with a coal-shed, which had to be laboriously filled through the summer and autumn, and which then only held three weeks' supply at the maximum consumption, and considering further that in one-tenth of the space there could be put what represented eight months' supply of oil, he did not think it was necessary to further discuss the question whether or not there was a saving of ground space. The fact of the matter was that there were such a terrible lot of ghosts raised in Mr. Porter's paper that he could not undertake to lay them all; but, with a little more light, many of them would be laid without trouble by anybody. He thoroughly disputed the statement that the results had fallen short of the guarantees by 60 per cent. Every guarantee they had had been exceeded. They had plant first for 750,000 cubic feet, and they made more than a million; they obtained two plants for 900,000 cubic feet which produced 1,150,000 cubic feet each; they were guaranteed 6 candles per gallon, and they got over 7; and the coke, he maintained, was well within the guarantee, after a proper allowance had been made for the quantity they burnt in keeping up the extra plant to meet emergencies. On not one point had they been deceived; but, on the contrary, they got more than they ever hoped for. Mr. Porter had shown a strong bias against water gas; and perhaps he would hardly be pleased to know that the price of oil was coming down. But it certainly was; and, with the extension of the oil-fields before them, it must come down still further. He would not attempt to prophesy, because it was dangerous; but he should like to know if anyone could be mentioned who, having taken to water gas, had been inclined to give it up. He was not aware of such a person, and had not heard of anybody being disappointed with its working. He thought the last paragraph of the paper was a little ungenerous. It seemed to imply that all who had taken up this system were either very stupid or very reckless. He (Mr. Stelfox) was, however, quite prepared to take the responsibility. He thought if people did for others what they would do for themselves if the place and the money were their own, they could not be asked to do more. If the undertaking he represented were his, he should do exactly the same, only more so. He had had from seven to eight years' continuous work with water gas; and since the day he started the plant it had never been out—except momentarily, perhaps, on a Monday—and they were more and more satisfied with it every day. In all respects it compared most favourably, both as to efficiency and ease of working and the readiness to respond to any sudden call; and he certainly should feel very helpless if anything occurred to prevent its being used. He had not referred to those items in the paper that the anti-water-gas people brought up which they called "collateral advantages," though they could scarcely be regarded as collateral; but there were a great many which, though it was difficult to show any figures on paper, were well known to everybody who had had the privilege of working a water-gas plant for a year or two.

Mr. J. P. LEATHER (Barnsley) said, after the speech they had just heard, it was hardly necessary to say anything on the subject before them; but he might add a word or two on some points. Mr. Porter gave as a reason for reading his paper that it might lead to a full and interesting discussion. While the author was reading it, and he (Mr. Leather) listened to the tone of his voice, he wondered whether he was really in earnest, or was only acting a part—attempting to show up the disadvantages of water gas, in order that his hearers might see through all his arguments, so that he might really advertise it. The different contentions were so greatly exaggerated as rather to point to the opposite conclusion being the correct one to be taken. With regard to the advantages of carburetted water-gas plant, when he advised his Committee to adopt it, he was to some extent in the position of Mr. Langford. He found he must soon have some extra manufacturing power, but at the same time he told them he thought he could save £1400 a year on the mere question of enrichment, though his calculation came out a great deal more than that. Of course, he expected to get his oil at 3½d. per gallon, though he actually paid close upon 5d. for it; but, in spite of that,

he had pointed out, in his annual report to the Committee, that they had saved on the extra cost of cannel more than the total expenditure on the oil. So that that which was one of the principal advantages, in addition to the ready putting up of the plant, had been fully realized. It was said that they usually worked oil at 7 candles per gallon; and he was practically satisfied that this could be done. But it was a good deal above what was originally promised, as Mr. Stelfox had noted. In 24-hour tests, they got up to considerably more than 8 candles per gallon, and used 2·8 gallons per 1000 cubic feet during the period they employed the plant, and had made about 20-candle gas. The coke would also come out under the guarantee. To pass on to the question of the actual cost, Mr. Porter used rather a remarkable word when he spoke about the percentage of efficiency, by which apparently he meant the amount of gas produced as compared with 200 days' maximum make. He (Mr. Leather) did not know who had 200 days' maximum make, but he certainly did not. Possibly some people did make 200 times as much in the year as the highest day's maximum. This, however, was not the maximum capacity, unless they were working up to their very last retort; if they were in the common condition, especially with new plant and extensions, they had about 20 per cent. reserve. In his own case, the actual annual make was equal to 165 times the maximum daily consumption; and, remembering that he had 20 per cent. reserve in addition, he should say that 200 was much too high a figure to give, and that 130 would be more like the truth. Now, taking these statistics as a guide, they were only going by what the engineers had thought necessary to put down in view of an ultimate extension. He, for instance, had put down plant to make 1,500,000 cubic feet of water gas a day; but they had never yet made 1,000,000 cubic feet. They had produced at the rate of 1,200,000 cubic feet in a set which was only guaranteed to make 750,000 cubic feet; and consequently, if they only had one set, they would be amply supplied for last winter, and for some years to come. He was simply ahead of his requirements. With regard to the actual cost of the plant, the figures given were not quite so high as £15,000 for a million cubic feet. They spent about £12,500 for a nominal 1½-million plant which would really make more than 2 millions. But this did not include a relief holder, or exhausters or purifiers. Still, when it was calculated on the actual maximum quantity the plant could make, it would work out to considerably less than at the rate of £15,000 for a million cubic feet per day. He did not understand the allusion to the question of coke-yard room, or what was really meant by the yard space taken up by the supplementary coke-stack. If they used the coke which was made, they did not want another stack; and, in fact, this was one of the chief reasons with him for adopting water-gas plant. He made 21,000 tons of coke a year, and he had one customer who took from 3000 to 4000 tons. All the rest of the coke had been sold in the town; but the 3000 to 4000 tons had to go outside at a slightly reduced price. The new plant had benefited him so much the more because, as the gas-works belonged to the corporate body, there had been a great objection to selling coke outside the town at a lower price than the ratepayers were charged for it; and consequently the price inside the town was kept down. But now he had 4000 tons less to dispose of, so that he threw over his outside customers, and told them they must pay his price or leave it; and he could sell all the coke in the town at a higher figure than he was accustomed to get before. Mr. Porter had taken the 10 lbs. of fuel, which he said was used more than the guarantee, at the cost of 1d. per 1000 feet; but he (Mr. Leather) did not know how he arrived at it. His coke always sold at 6s. 8d. a ton before; but Mr. Porter apparently reckoned it at 19s. With reference to atmospheric burners and gas-engines, they had not found any difficulty whatever. Everyone had complaints about gas bills, and one gentleman objected to the large consumption in his gas-engine. Previous to doing so, he had an idea that the water gas was responsible for it; but, on making inquiries of some other people in the same line, who used gas-engines, in order to find out whether or not they had noticed any increase, he was told they had not. Consequently, he did not think there was much in the question of adjustment of air or the quantity of gas used for engines. He had also had a complaint from someone that it took half as long again to boil a kettle by water gas as it did before. But, as it happened, they were not making any of the gas at the time. The working cost had been referred to by Mr. Stelfox; and therefore he (Mr. Leather) need not repeat what had been said. It was quite wrong on Mr. Porter's part to take the estimated cost before the price of oil went up, and to compare it with the cost afterwards. They had been paying 4d. a gallon; but he bought a large quantity lately at a considerable reduction. To compare that with the estimate made when the price was low, was beside the real question. He would repeat what Mr. Stelfox had said—that he did not in the least regret having recommended his Committee to go in for carburetted water gas. He would do the same again if circumstances required it. To one point only would he refer in Mr. Langford's paper—namely, the question of naphthalene. It had been mentioned as an advantage that by mixing carburetted water gas with coal gas the naphthalene difficulty was overcome. This had been questioned, and his own experience did not prove that it was effectual. As many members were aware, they, in fact, took the naphthalene out of the gas before purifying. When they started water-gas making, it was thought that perhaps there was no necessity to trouble about that; and so they let the process cease. After a little while, however, they found the difficulty cropped up, and had to put it again into use. This, no doubt, depended to some extent on the way in which the plant was worked, and the temperature in the fixing chamber. Mr. Leather added, in reply to a question by Mr. Porter, that he had had the water-gas plant in use for one winter.

Mr. C. Stafford Ellery (Bath), dealing first with Mr. Langford's paper, said it was a little unfortunate that they called this gas water gas. Personally, he preferred to call it oil gas—a term which conveyed quite as correct a meaning, and removed a prejudice in the minds of the uninitiated among the consumers. He referred to the prejudice created at the time the straight water gas was supplied uncarburetted—when it had no smell, and when there was nothing to distinguish it, so that people might know when they were in the vicinity of danger. Now it was an oil gas; and it was better to call things by their proper names. It had occurred to him, too, that it might be interesting to refer to some experiments he had made with regard to testing. A great deal had been said as to the gas stratifying in the holder; and, for the purpose of ascertaining whether or not this was so, they had let into the crown of the holder a tube perforated at regular intervals; the outlet being somewhat less than the perforations. In this way they got a sample of the whole of the gas at the depth it might happen to be in the holder; and when testing this gas as against the ordinary method, he could not see such difference as would lead him to suppose that there was any danger of stratifying, or that they were taking out at one time a different gas from that which they had at another. It was a simple test, which could be easily applied. One other suggestion he might throw out, in case it might be of service, with regard to testing for carbonic oxide, as it was produced in the generators. They adopted a method now of drawing off regularly throughout the make a sample of the gases as they were being produced; and a jet was burning in the ordinary fashion of a jet photometer, so that the man in charge watched the carbonic acid he was making, and regularly entered the height of the flame as he did the height of the flame of the coal gas. With respect to the consumption of coke, it should be remembered that the percentage of ash varied very much in different works. It was not reasonable to expect that a man working with coal containing from 13 to 20 per cent. of ash, could get the same results as one working with coal containing only 2 per cent. He had tested coals with these extremes, and he thought it was a point which should be borne in mind. Coming to Mr. Porter's paper, they ought to thank him very much for an entertaining morning. He (Mr. Ellery) had been wondering which to admire most—Mr. Porter's style of delivery, his courage, or his sense of humour. He had been trying to picture him sitting in his study writing this paper; and, having heard of a man having his tongue in his cheek, he wondered whether Mr. Porter adopted that attitude. He certainly sat up late the previous night reading the paper, and was very grateful to Mr. Porter for such a pleasant half hour; and the meeting must feel somewhat the same. But, after all, the effect of the paper might go outside the room; and he wished that someone with a little more practical knowledge had been permitted to look through the paper before it was read.

Theory was dangerous; and it was clear to demonstration how dangerous it was when it was not properly supported by some amount of practice. Mr. Porter had endeavoured to be accurate—he had actually lapsed into four places of decimals in order to give exact figures; and how in the world, after being so careful, he could plunge into the terrible mistakes he had made elsewhere, for such a careful man, was a puzzle. From the figures given in the paper as to the quantity of this gas which had already been produced, it would be seen that it was not very insignificant; but it showed that a number of men who were considered to know something about supplying towns with gas must have gone sadly wrong when they saw that 10,067 million cubic feet of it were made last year. It really was a serious thing if these men had gone so absolutely wrong as Mr. Porter would have the meeting believe. He did admit—and he (Mr. Ellery) was glad he allowed so much—that there was just a chance, before the climax came, that a few other good men might go wrong in the same direction. This other idea about the percentage of efficiency looked very fascinating; and it took him a long time before he could see what it meant. But he began to see it now, though he was thoroughly at variance with the author, because, as had already been pointed out, what man, in putting up a retort-house, would only put up the exact number of retorts he would require for the next winter? Why was it they had still a margin of water gas or oil gas beyond what they wanted immediately? It was because, as prudent men, they looked a little ahead. Every year those favoured by having this plant would be getting nearer to their maximum efficiency. It was not because to-day, at Bath, they were only working up to (say) 25 per cent. efficiency, that as years rolled on they should not get as near efficiency with this plant as they did in the retort-house. There was a fair challenge thrown out with regard to gas-holders; and if it would interest Mr. Porter to know of one town where the provision of a holder had been staved off in consequence of the erection of water-gas plant, if he would come to Bath he (Mr. Ellery) would be delighted to show him one. There, for years, they had been able to put off the expenditure of probably £20,000 by spending something like £10,000 on water-gas plant. This meant, not that they could store a million cubic feet of gas, but that they could make a million. If they had a gasholder, it was empty when they had drawn the gas from it; but the water-gas plant was still going on making. This was a point which was entirely lost sight of when comparing the value of such plant with a gasholder. In the matter of cost, Mr. Porter himself had told them that the cost of the plant was about one-half that of coal-gas plant. He (Mr. Ellery) thought he could show him that this figure would bear revision; but he would accept it, and those who wished to put up economical plant for the production of gas would bear in mind that Mr. Porter had said they could do it for less than half the cost of coal-gas plant. Ground space had already been referred to; and it was another evidence of the entertaining nature of the paper. He might go on to point out a little inaccuracy in the figures; but he had already taken up too much time. He did think, however, that the question of coke should be further emphasized. How Mr. Porter, coming from the district he did, could say that taking off the market something like 250,000 tons of coke, and not putting on it about 650,000 tons more, which would have been the case if water gas had not been manufactured, made no difference, he could not see. If people who had been producing oil gas had not made that but coal gas, there would be something over 500,000 tons of coke thrown on the market. In the district in which he lived they found very great benefit from being able to control it to a certain extent; and he believed the day would arrive, when the advantages of oil gas were better known, that the coke market would, as the result, become much more healthy. One other matter which had been much spoken of was the labour question. There was naturally a certain diffidence in speaking of the great advantages gained in this respect. Those who used water-gas plant knew from experience that it was of great value in helping the best men to do the best work. It was a very real advantage to those making carburetted water gas that it assisted very materially in dealing with this question. It was probably too late now for Mr. Porter to alter the title of his paper; but, if not, he would suggest to him that it should be headed: "Water Gas: A Romance. By Robert Porter."

Mr. Isaac Carr (Widnes) said he should not like it to go forth that there was no one present in sympathy with the paper read by Mr. Porter; and he would further remark that the title was perfectly correct. It was a description of facts, and not romance, as had been facetiously remarked by Mr. Ellery. He had the honour and privilege some years ago of giving evidence before a Departmental Committee on this question, and the effect was to show that, whatever advantages there might be in this process of gas manufacture, economy was not one of them. He held that opinion very strongly then, and he held it still more strongly, if possible, to-day. When he spoke of the economy of manufacture, he meant particularly from the consumer's point of view; and he had not seen or heard anything to indicate where the process of water-gas manufacture was in the slightest degree going to improve the condition of the consumer. The view the Departmental Committee took on this particular point, as was shown by their subsequent decision, was that, if there was to be no economic advantage to the consumer, he had a right to be protected by limiting the quantity of water gas which should be mixed with coal gas. Mr. Stelfox disagreed entirely with the figures given by Mr. Porter where a difference was shown between 41 lbs. and 87 lbs. of coke used; and he said that if one man could make his gas with 41 lbs. of coke another could do so. If this was so, he had a right to take the same standpoint in arguing this question. If he could put coal gas into the holder for 5d. per 1000 cubic feet one year—and that was his lowest figure—another man could do it; and he would point out that this 5d. was practically one-third or one-fourth of the cost of water gas as manufactured. Some gentlemen seemed to smile at the remarks of the previous speaker when he talked of the conclusion at which Mr. Porter had arrived. But what they had to deal with was to make gas in the most economical fashion, and sell it at the lowest possible price. Could anybody show him how, by the introduction of water gas, he could reduce or economize in any way over his present mode of working? As he understood it, at the present time, by introducing water gas, he would have to make a very considerable increase in the selling price of his gas.

Mr. H. Green (Preston) said he spoke on the subject with some degree of diffidence, for it was rather difficult to analyze off-hand, a paper like Mr. Porter's; but he should be glad to give a few of the results of his own experience. He regretted, with Mr. Stelfox, that that of Mr. Porter was not practical. Of course, if he had had practical experience in manufacturing carburetted water gas, many of the statements which appeared in his paper would not have been made. Taking Statement D, he put down 3·28 gallons of oil as the basis on which he calculated his price. This would give 22·96-candle gas; but he (Mr. Green) should like to know the quality of coal gas with which he was comparing it. He knew that many corporations supplied 18-candle gas, though no gas company could do so with the same materials; but the corporations stood in a better position than companies. His own Company was one of the unfortunate ones who were tied down to 18-candle gas, and had to supply it; and it was examined by a Corporation who were somewhat antagonistic to them. With regard to the quality, they made the oil gas of 21 candles and the coal gas of 18 candles. He had not come to the meeting prepared with the exact figures as to the cost; but, speaking from memory, the oil gas cost about 3¼d. per 1000 cubic feet more than the coal gas—that was to say, the 21-candle gas cost 3¼d. more than the 18-candle. This was a very important element in the question. Many companies who adopted oil-gas manufacture did so, not for the reasons Mr. Stelfox had laid down, though they might influence them somewhat, but in order to obviate the necessity for employing so much cannel coal. A few years ago, cannel cost from 40s. to 50s. a ton; and they had to use a large quantity to get the illuminating power up to 18 candles. At that time it was considered desirable to take up carburetted water gas, in order to raise the light-giving quality; and it had fully answered all expectations, and given every satisfaction. During the past year, many had suffered from the advance in the price of coal, though happily in Preston they had not (having a continuous contract for coal at the price ruling two years ago), and they were also paying a low price for oil; so that he could compare the two things at the normal price. This being the case, his comparison was a fair and reasonable one. With regard to the quantity of coke used, a good deal had

been said about the different quantity needed; and it had been stated that it was not working out to the figures anticipated. There were certain reasons why the coke question had not answered their expectations, and one of them applied to his own case. Before they adopted carburetted water gas, all the coke, or most of it, was passed through a half-inch screen. A great quantity of it was breeze, so small that they could not find customers for it, and some 3000 tons or more, according to circumstances, had to be carted to a tip, and thrown away. Every bit of the coke was now used under the boilers instead of being thrown away, and costing 1s. a ton to remove. But it had increased the percentage of coke per 1000 cubic feet simply because one could not expect to get the same results from waste breeze, which before was thrown away, as from good coke. Previous to the adoption of water gas, they had something like 4000 to 5000 tons of coke sent out of Preston; but now they sent scarcely any away. During the past twelve months they received 15s. a ton, whereas previously they could not get more than 10s. a ton; and at other times, when the price was as low as 6s. 8d. or 7s., they had to send 5000 tons out of the town at 4s. or 5s. The carburetted water-gas plant never had the benefit of all this. There were great elements, outside the actual production of the gas, arising from the making of the coke, and other reasons. For instance, taking the gasholder capacity, Mr. Porter said this question was not affected; but if it had not been for the carburetted water-gas plant, he (Mr. Green) would before now have had to put up a holder which would have cost £20,000. The interest on this capital outlay was saved; but the carburetted water gas did not get credit for it. They were told that water gas cost as much as coal gas; and so it did. But, in the first place, they had 21-candle instead of 18-candle gas, and they sold many pounds' worth of coke at a higher price instead of throwing it away. No doubt Mr. Porter had made his comparisons with great satisfaction to himself; but he (Mr. Green) should be glad to know what quality of coal gas he took when doing so.

Mr. J. Wilkinson (Drighlington) said he should much like to have a further explanation of the simple test to which Mr. Ellery had referred for getting a proper mixture of gas from the holder. He understood him to say he inserted into the holder a long tube with holes bored at intervals. They were led to believe that gas was supposed to increase 1-10th in pressure for every 10 feet in height; and therefore, if he put down a holder 40 feet high a long pipe which had a dozen holes in it, he failed to see how he got a full mixture of the gases from every part of the vessel. He took it that as the gas was elevated to the altitude of 40 feet it would really have an increased pressure of about 4-10ths at the top, and therefore it would come from the top, and would not be a complete mixture of gas throughout the whole depth of the holder.

Mr. W. Carr (Stalybridge) said he took some exception to Mr. Ellery's mode of discussing Mr. Porter's paper. He did not think it was advisable to treat it as a comic one, because there were certain very serious statements in it. He (Mr. Carr) might lay himself open to the accusation of talking about something which he did not understand, because he had not had any practical experience of water gas; but very many of those who had had such experience had to carefully consider the matter before they advised their boards or committees to invest money in water-gas plant, and had to make up their minds upon the matter. He certainly thought that Mr. Porter's statements were open to criticism; for instance, in Statement C he put down a very large capital expenditure for the cost per million cubic feet of coal-gas plant. He did not understate this at all. He (Mr. Carr) thought a much less expenditure than £28,600 would produce a million cubic feet of gas. Mr. Ellery had spoken at considerable length with regard to the other figures, and said he would not go into their inaccuracies; but this was the very point they wanted gone into. He would give Mr. Stelfox credit for having pointed out some of them. For instance, Mr. Porter had put down as the cost of carburetted water gas 21·3d. per 1000 cubic feet, which Mr. Stelfox said was incorrect. He should like to know how far the figures given exceeded the actual cost, in his experience.

Mr. Stelfox: Only about 8d.

Mr. Carr said this brought the figure down to the estimated 13d. He always considered that Mr. Stelfox was in a more favoured position for the use of water gas than anyone in the country; and had he (Mr. Carr) been in his position, he should most probably have adopted the gas, as he did. But when they considered the case of inland towns, the circumstances became altogether different; and as the bulk of the members represented inland towns, they had to look at it from their own particular point of view. He wished that the matter should receive serious attention and that they should get all the facts they could. For instance, the point that Mr. Porter was 8d. wrong in his estimate of the cost was just the sort of information they wanted to get. It was very desirable that they should know to what extent these figures were inaccurate, and how far they were worth taking notice of. Mr. Ellery almost went into the subject of labour, but stopped short. He (Mr. Carr) did not know whether he need go into that particular question, but he might say that a number of gentlemen in his neighbourhood were building a cotton-mill, and were putting forth as one of its advantages the fact that it would give employment to a lot of labour, and that a number of toilers in the district would be able to find work; and, further, that it would increase the prosperity of the town. In the present case, it had been given to them as a special recommendation of water-gas making that it would throw a lot of men out of work.

Mr. S. W. Durkin (Southampton) said he had been making carburetted water gas for two seasons, and, though he had unfortunately no figures with him, there were one or two points in the paper to which he might refer. He did not quite know if Mr. Porter was serious, but he might say that carburetted water-gas plant did certainly take up less space than coal-gas plant for making a given quantity. In his own case, they displaced half a retort-house which produced 320,000 cubic feet of gas per day; and on the site they had put up carburetted water-gas plant equal to a daily production of 1,300,000 cubic feet. With reference to the coke being dumped down, they used the freshly made coke for the carburettor, and there was no storage of it in the yard. Coke storage with him was very limited; and using so much for the manufacture of water gas, he had no need to stack it. It also enabled him to get a good price for the coke coming from the coal-gas plant, which otherwise would possibly have been sent out of the town at a very much reduced figure. His oil was stored in a field some little distance from the place where it was used, and was brought down by a pipe to the gas-works.

Mr. Ellery, in reply to the question which had been asked, pointed out that he said nothing about a 40-feet holder, and, in fact, when the test was made it was probably from 10 to 12 feet. The perforations were rather less than the area of the pipe itself, so that in drawing on the pipe to its full capacity, all the perforations were helping to the delivery of the gas.

Mr. J. Booth (Southport) said Mr. Langford did not appear to have any station meter for the carburetted water gas; and he did not quite understand how he arrived at the quantity made. Mr. Porter's paper was certainly an interesting one; but he (Mr. Booth) must say, from practical experience, that he totally dissented from the opinions expressed therein. He was not aware of the nature of the paper, or he would have been prepared with figures; but the practical result in his case was some pence per 1000 cubic feet less than those given. It was not necessary to go over again all the statements which had been made; but he might say that what induced him to advise his Committee to put up water-gas plant was that he wanted more storage. Of retort power, they had plenty; and, as others had said, the result of putting up the carburetted water-gas plant, as compared with erecting a new gasholder, was the saving of a good many thousand pounds. In making the comparison between the cost, Mr. Porter did not seem to have taken this into account, or made any reference to the fact that it was no uncommon thing at a large gas-works to have a number of retorts under a slow fire in the depth of winter; thus taking a quantity of coke and labour which was not necessary in the case of water-gas plant, which could be started making gas in three hours. This was a great advantage. He did not regret having taken the steps he had, and considered it was the proper thing in all large gas-works to have plant for the production of carburetted water gas.

Mr. R. G. Shadbolt (Grantham) said he had never made water gas, but he might state the impression made on his mind by listening to the two papers before them. He looked forward to Mr. Langford's paper with a good

deal of interest when he read the title: "Why I Adopted Water Gas." That was a question which must arise when one had to consider the reconstruction of works; and most of them went into the matter by inquiring from those whom they could approach as to whether their respective efforts had succeeded, what had been the cost, what were the advantages, and so forth. He came to the conclusion that he could not make water gas as cheaply, taking it all round, as coal gas. He need not go into all the details, but this was his general conclusion; and when he saw the title of Mr. Langford's paper, considering that he was right in the centre of the country, he thought that possibly he should have some reasons given which had previously escaped him. With all due respect, he must confess to a certain amount of disappointment. To sum up his paper, Mr. Langford seemed to have adopted water gas because he was in a bit of a hole, and because he had come from Bath. On the other hand, at the close of his paper he candidly told them that he could make coal gas cheaper than water gas. This gave one the impression that, after all, the conclusion he (Mr. Shadbolt) came to was right; and there was nothing in the paper which would induce him to arrive at any other decision had he to go over it again. Coming to Mr. Porter's paper, there seemed to be some misapprehension with regard to his factor of average efficiency, or the percentage of efficiency obtained. This, of course, was the possible number of maximum days' make in the year; and some members had rather questioned the propriety of the figure. But the conditions varied very much. In his own case, their yearly make was nearly 210 times the maximum day's make; so that Mr. Porter was fairly within the mark there. If the 200 was too large a multiplier, of course it would affect his conclusions. Again, he had taken the Board of Trade returns, which had been made by gentlemen using water gas—they were not made by Mr. Porter—and on this basis he arrived at the average efficiency of 48·37 per cent. of coal-gas plant. In his estimate of the cost of coal-gas plant, as he (Mr. Shadbolt) understood, he allowed a margin of 25 per cent.; so that his basis was sound so far as it went. He did not wonder at Mr. Ellery not being able to understand this average efficiency business, considering that he read the paper about one o'clock in the morning. With all the humour which had been infused into the subject under discussion, not only by the author, but by the various speakers, he did not see, as an absolute outsider, who liked to weigh the *pros* and *cons* for himself, that the average efficiency, if true, had been disputed or interfered with; and if this was the fact, that the average efficiency derived from the use of water-gas plant as practised in this country—and that was the point of the paper—was only equal to 50 per cent. of what the coal-gas plant did, it was a simple calculation that twice the amount of money must be expended to get the same efficiency out of the plant. They could not lay the charge on the makers of water-gas plant of under-estimating its maximum capacity when recommending its use. They might be more modest than coal-gas plant makers, but he did not think it likely. Altogether, to his mind, water gas did not as yet appear to be so economical as coal gas, taking the country through; or, to be more particular with regard to his own case, he should consider it a retrograde step to introduce it. Mr. Stelfox was exceptionally situated; and this, of course, had a great bearing upon the cost. He did certainly hope, with all the fault likely to be found with Mr. Porter's paper—for he had laid himself open to a tremendous "slating"—that something more definite would have been stated on the figures. He had taken the absolute average efficiency, and this had not been disputed. Then Mr. Stelfox deplored the small coke returns. These returns were given, like the gas returns, by the gentlemen making the water gas; and, though there were only seven of them, this was not the fault of the writer. As to the average of 55·23 lbs. of coke, it seemed to him, in the face of the remarks by Mr. Stelfox, who had analyzed the figures, and found that they ranged from 87 lbs. to 41 lbs., that some of the gentlemen had included the boiler fuel and others had not. This was the only explanation which occurred to his mind; but, really, on analyzing the working statements given from time to time, one found that if the boiler fuel were taken into account, it pretty well equalled the lowest point. To sum up, he did not think he should be induced, either by Mr. Langford's paper or by the discussion, to take up water gas yet.

The PRESIDENT said this had been one of the best discussions he had ever listened to. The gentlemen who had analyzed the paper of Mr. Porter had certainly made a very good case. Mr. Porter had written the paper for the purpose of discussion; and he did not think he could seriously intend to stick to some of his arguments, because they were, in his opinion, not sound. With regard to the cost of plant, in his own particular case they had either to go to fresh ground or erect extra plant on the existing works. The ground was not large enough to put coal-gas plant down; but there was quite sufficient room to erect a good installation of water gas, and at a very moderate cost. They did put down a plant, which at the time was nearly equal to the coal-gas plant—about 2½ million cubic feet per day. This was done (omitting the cost of a relief-holder, retort-house, and so on) for £17,000, which seemed very moderate. In regard to its efficiency, they had only used perhaps a little more than one-third of it. One winter they did put on, temporarily, the second set; but in general one set had been sufficient. They did not pretend to give more than one-third as much water gas as coal gas. It was fair to say that, although the efficiency of the plant was only 33 per cent., if necessary, at a moderate cost, they could run it up to 50 or 60 per cent., as they had done frequently. In case they had need to tide over a bad time—as they did the winter before last, when the second plant was put on—or if coal was scarce, or anything of that sort, they could get along without the slightest difficulty. They had no trouble in the retort-house with the workmen, because next door there was the water-gas plant, and the stokers knew it. Before they had the water gas, the coke was a drug; and they had to do as Mr. Leather did—get it out of the town at a reduced price. But now they used a good deal of what they produced, and made so much less than before that the price went up; and it had never gone back since. In fact, it made a difference of thousands a year to them in the price of coke, which was a very good friend to the retort-house. It kept the retort-house going regularly; they never had any laying up of retorts in order to meet emergencies. The water-gas plant did all this; so that the retort-houses were kept going without any change or any loss, which was always evident when a retort-house was stopped. With regard to the quality of the gas, up to 50 and 60 per cent. mixture they never had the slightest complaint from anyone, either as to gas-fires or gas-engines; and he did not think there was any appreciable difference. It had also relieved the naphthalene difficulty. Previously they had a deal of trouble from that source; but since introducing water gas, they had scarcely any difficulty at all. Formerly they had hundreds of cases of complaint; whereas now they had not more than three or four. The cost of water gas was put down by Mr. Porter, he thought, at a very excessive figure. He had taken it out for the last three years with the capital cost put on; and it was not £17,000. He must admit the oil was cheap, because they had a very long contract at a low rate. The prices ran 16·7d., 14·66d., and 14·91d. per 1000 feet for 21½-candle gas—the actual figures being 21·62 candles, 21·53 candles, and 21·40 candles. The price of the oil was 2⅜d. With regard to the coke employed, he thought there must be a clerical error in the case of the one using 87 lbs. If it was correct, he must have been using cannel coke, which had a very large percentage of ash. Their figures ran something over 50 lbs. for boiler and generator; and they never used less than 20 per cent. of cannel.

Mr. LANGFORD, in reply, said his storage capacity was not too limited; and he should not be in a hurry to put up a storage holder or relief holder. But when the time came that the consumption went up, he could easily put in a relief holder, and throw the other into storage again. The inlet and outlet from the water-gas plant was connected on the inside of the ordinary connections with the coal gas, so that merely by shutting or opening the valves he could use it either for water gas or coal gas. His purification was entirely by oxide of iron; allowing the carbonic acid to go forward, and enriching to make up the illuminating power. Mr. Booth asked how he arrived at the quantity of oil gas made, not having a separate station meter. His plan was this: He shut off the water-gas holder for perhaps five or six hours a day; and so he got to know pretty well what he was making of coal gas, and separated them. This was how he arrived at the price. Mr. Shadbolt jocularly remarked that he thought he might have

been influenced in his decision through coming from Bath; and he was quite right. If he had not had practical experience from being at Bath, it was very certain he should not have had confidence to go in for water gas, and have induced the Longton Corporation to adopt it. This showed the truth of Mr. Stelfox's remark that one needed practical knowledge of a thing before criticizing it or adopting it. There was nothing like practice. He must say the figures looked a little bit against water gas; but he was pleased to find there was no gentleman present—and he had never heard of one—who had gone in for water gas, and who had not been pleased with it. Personally, he derived great comfort and relief from anxiety, and felt very proud that he recommended his Committee to go in for it. The capital cost was £5500 for a make of 600,000 cubic feet per day, not including purifiers.

Mr. ISAAC CARR asked if Mr. Langford could give them the cost of water gas and of coal gas respectively at Longton.

Mr. LANGFORD said that, at the price of coke and oil at the present moment, he should make the cost of water gas 11·3d. With regard to coal gas, he would rather not answer the question until the end of the month, because their year ended then, and the figures were not yet complete. But he still said that his make, both per ton and per mouthpiece, would be up to the tune of some hundreds of cubic feet this year.

Mr. PORTER, after thanking the members for the way in which his paper had been taken up and criticized, said that it was brought forward with the intention of extracting some more facts from the good people who made water gas and swore by it. They had not much information; no one had gone into figures giving the exact cost. Here they had a statement put forward as to the cost of manufacture to-day as ruling throughout the country, not in one particular place; and not a single one of these figures had been upset. Mr. Stelfox and other speakers discounted the value of his paper because he had not had any actual practice. It was perhaps because he did not know much about it that he had written the paper; he wanted to know a little more. He certainly had been very anxious to put in a water-gas plant; and this was why he had been looking up the figures and going among his friends who were using it—accepting their figures as correct as he had done, and embodying them in his paper. If they were wrong, it was not his fault; and he did not think that it was necessary for a man to have practical experience of water-gas plant before he put it in. Several points had been taken up by the various speakers in reference to the cost of manufacture. Mr. Stelfox, as everyone admitted, was particularly well situated for getting his oil cheap; and he did not suppose there was a gentleman in the room who, if he was placed in the position of Mr. Stelfox when he put down his water-gas plant, would not have done likewise. But the paper embraced a general statement of water-gas practice throughout the country, and not the practice at Belfast. Certainly, Mr. Stelfox's figures were included in the statement, and to some extent would help to modify the efficiency of other plants in the United Kingdom. The average efficiency obtained from the water-gas plants, as given in the Board of Trade returns for 1899, was 48·37 per cent. It was unfortunate that more gentlemen did not give the coke returns. A point had been made that these returns were unreasonable, because the average was only taken from seven undertakings. But he could only take what was furnished; and these were their own figures. It had been pointed out that one of these undertakings used no less than 87 lbs. of coke. The gentleman who was working this plant was in the room; and he did not dispute the fact, and had nothing to say about it. He did not doubt, in his own mind, but that the coke return would have appeared considerably worse if every item had been included. There could not have been this great variation in the coke used in the seven undertakings without there being some explanation which they had not yet had. As to the humour that had been introduced into the discussion, that had been dealt with by other speakers. He was pleased that the paper had been so entertaining; but probably they would have some other opportunity of hearing more about it. He did hope they would all learn something from the figures which he had put forward. It was his desire that the matter should be thoroughly discussed. When he referred to it in his Presidential Address four-and-a-half years ago, he had many remarks thrown at him for taking up the matter as he did, and not giving the members an opportunity of discussing it. They had now had the opportunity—not so fully as might have been the case, but no doubt the subject would receive further discussion. He could only thank the members for the patient hearing they had given him.

ESSAYS AND REVIEWS.

ORIGIN OF SOCIALISTIC TRADES UNIONISM.

IN a homely, friendly address distributed at the end of the century to the workpeople of the South Metropolitan Gas Company, Mr. George Livesey briefly reviewed the wonders of the industrial and economic progress of the civilized world during the last hundred years, and remarked that the working classes have derived relatively as much benefit from it as any other order of the community. Sixty years ago labourers' wages in London were at the rate of 3d. an hour, or 2s. 6d. for a day of ten hours. In 1848, the wages of gas workers were 3s. per day. There was no Saturday half-holiday for either the officers or workmen, and consequently no games were played. Cricket and football were not for working people, nor even for persons of the middle class. Stokers worked seven days a week down to about 1872. The actual condition of the South Metropolitan gas workers need not be particularized. Suffice it to say here that the Chairman does not claim any special merit for the Company for improving the pay and position of their workpeople. He states that wages have gradually risen under the operation of the law of supply and demand. "They had to be increased from time to time to attract men to the Company's service;" and other things were added to keep them and secure undivided allegiance in the service.

A couple of months later, Lord Avebury, in the course of his presidential address to the Royal Statistical Society, said something which may be qualified as exhibiting the reverse of the medal. He said, with reference to the state of the people of the great European countries, that it might have been hoped that the progress of education, the marvellous discoveries of science, and a better understanding between nations, might have done much for the welfare of mankind, and rendered the conditions of life more easy. "Unfortunately, this hope is far indeed from being fulfilled. The pressure of taxation, the low rates of wages, and the long hours of labour are increasing the Nihilists of Russia and the Socialists of France and Germany; and unless some change is made in the present tendencies, it is impossible to contemplate the future of Europe without grave forebodings."

At a first glance, it appears quite impossible to harmonize the optimism of Mr. George Livesey and the pessimism of Lord Avebury. It might be thought that these views are as opposite as light and darkness. But, just as light and dark are relative expressions which it is quite possible to apply to the same thing, so there is a common truth in both these statements. Lord Avebury's observation, moreover, will bear some correction. Unquestionably, the pressure of taxation, the low rates of wages, and the long hours of labour are strong influences driving the Continental workmen into the ranks of the Anarchists—not the Socialists. There is a distinction, which it is well to observe. The politics of Anarchy are a revolt against the over-government of the people (which means over-taxation) in the countries where this cause flourishes. It cannot live in English air. Socialism in Germany is not wholly a working-class delusion. Socialism of a mild, but still a mischievous, kind does exist here, but, remarkably enough, almost exclusively by favour of Trade Unionism.

Has anybody tried to account for this odd alliance of Trade Unionism with Socialism in England? It is well worth looking into. The Union is not of very long standing; none of the older school of Trade Union leaders—knew it. The newer type of Trade Union leader—the professional agitator and organizer, who runs a Union as a business, without necessarily belonging to the trade upon which it is based; or the Independent Labour politician, who may be a briefless barrister or a newspaper man—these are usually Socialists. They are the speakers who go about holding congresses, and get elected to county councils and on local authorities. Few of them get into Parliament, for the reason that working-class voters do not as a rule care for self-styled labour candidates. This is a phenomenon that must sorely puzzle the logically-minded "proletariat" of Germany and France. Socialist politicians are numerous, and a power to be reckoned with, in every Parliament in Europe except the British, in which their representatives can be counted on the fingers of one hand. The discrepancy between the noise made by Socialists in the British industrial world, and their impotence in respect to parliamentary representation, is glaring, and must mean something.

Socialism, in working alliance with Trade Unionism, is by no means a negligible quantity out of Parliament. Not for any political reason; because those who speak as Socialists in this country have committed political suicide by separating themselves from the national spirit and openly sympathizing with the enemies of England. Industrially, commercially, however, the giving of a Socialistic character to Trade Union counsels is a highly important matter. It has set the ideals and demands of Trade Unionism dead against the ordinarily accepted tenets of

classical political economy. There was nothing in their Society principles to prevent the old Trade Unionists, from Broadhead to Knight, being staunch Individualists. Other leaders of the Trade Unions which are connected with the trades that work up imported raw materials, such as cotton, and make articles for export, must needs be strong Free Traders. The Trade Unions which have nothing to do with this order of production, as those connected with the building and engineering trades, the transport service, and the gas industry, ignore the deductions of political economists, and attempt to act up to the narrowest dictates of class selfishness. These Unions stand for the only British variety of Socialism that keeps itself alive.

Apart from the mere personal laziness and unfaithful service which assumes a garb of respectability in calling itself Socialism of the Trade Union pattern, there is still something puzzling in the attraction of these doctrines for an average British workman. Many observers of the deterioration of the British workman under Trade Union influence must have wondered at the spectacle, and asked themselves why the wage-earner should abjure the law of doing the thing in hand with all one's might, which other members of the community recognize as the first condition of success in the transaction of affairs. We believe the problem can be solved by reference to the most conspicuous error of the gospel according to Adam Smith—the gospel of getting on in the world. Adam Smith held, and wrote, that the progress of improvement depends upon "the uniform, constant, and uninterrupted effort of every man to better his condition." This bettering was limited, by Smith and his disciples—down to their scribe, Dr. Smiles—to the one consideration of pecuniary gain.

All these wise men seem to have regarded the "man" of whom they predicated their various notions as the possessor of limitless powers and opportunities for "rising" in the world. He was to be always "bettering" himself, by getting more money, and pushing himself upwards in the social scale—nothing else counted—or else, *ex hypothesi*, he must be written down a failure. Walter Wise could always look to become Lord Mayor of London, just as Tim Thoughtless was certain to fetch up in Botany Bay. How such a reading of the puzzle of the painful earth could ever be held simultaneously with the belief that mankind ought to rule themselves on the principle of procuring the greatest happiness for the greatest number, is one of the most striking of the paradoxes of the history of human thought. For it is obvious that if to become Lord Mayor of London is the crown and seal of worthy endeavour, only thirty or forty men of a generation can be regarded as having lived to any purpose. All the rest must be miserable failures.

Now the great army of workers for wages are, and must be, entirely out of this scheme of Earthly Providence. Not for them the gospel of getting on. Dr. Smiles could point no morals from the annals of the life of a workman who was no Hiram S. Maxim, but had only earned his daily bread in the sweat of his brow, married, grown old, and died belonging to the same state of life to which it had pleased God to call him at the beginning. What then? Are such men born to unmitigated sorrow and disappointment? Not so. But it is easy to perceive how, in their circumstances, they are tempted to concentrate their business faculties upon the plain things that Socialistic Trade Unionism professes to be alone able to procure for them—good wages, easy work, ample leisure, and a sense of having a powerful friend in need.

Benthamism has nothing to say to these men; and they for their part are sublimely unconscious that such a voice was ever heard in the world. To get on is not everything. Adam Smith's philosophy left no room for content in the breast of man. Yet the vast majority even of working men, if they are not contented in their own station, would certainly fail to find perfect satisfaction in any other. It is a last superstition of the Utilitarian School of English philosophers, that the Board School boy cannot be regarded as a perfect success unless he can get to the University, and that domestic service is not to be thought of as a possible career for destitute orphan girls. Those who are called to the board of life cannot be always "moving up one," like members of the Mad Tea Party in "Alice in Wonderland." They would not necessarily be gainers if they did.

At the same time, it must be admitted that the state of the wage-earner has seemed to lack satisfaction, both in current experience and in the ultimate prospect. The man had no part in the fruit of his labour, just as he had no responsibility for its failure; and he had nothing cheering to look forward to in the event of his outliving his working powers. The effect of these conditions was to degrade the man, and make him feel like a machine. It was quite natural, therefore, for the machine-man to fall in with the machine politics of Socialistic Trade Unionism. Mr. Livesey has made a great effort to correct this process of degradation, by giving men something to work for besides wages. Other influences—the progress of the times spoken of by Mr. Livesey—have helped the working classes of England more rather than less than they have raised the personal comfort of the rich. Take it all the way round, the Eighteenth Century was a more comfortable period for wealthy and privileged people than the class is ever likely to experience again. But the poor have now leisure—one of the greatest boons that can be given to men—books, and games; and if they have not a mind superior to the materialities that bulked so overwhelmingly with the Benthamites, it is not for the want of devoted teachers. This is why we can afford to be optimistic, even in face of the many discouraging things thrust under our notice in the contemporary state of Europe.

THE BURNING OF OIL IN TANKS.

A good deal of interest was naturally taken by large users of heavy mineral oils in the United Kingdom, in the disastrous petroleum fire which occurred at Baku in the beginning of February. On this occasion, 7 million "poods" of oil were destroyed; and there was a great loss of house and other property. The peculiar interest of this conflagration, however, proceeded from the serious questions it suggested respecting the conditions of the safe storage of heavy oils. It appeared to bring to the front, in the most dramatic way, the hackneyed topic of the relation between the flash-point of mineral oil and its liability to take and spread fire. For some inscrutable reason, the absolute security of high flash-point oil has been made a sort of dogma by a certain sect of politicians in this country. Only raise the flash-point high enough, according to this assumption—say, to 105° Fahr.—and there will be no more lamp accidents or petroleum fires. The London County Council have asked the Government to take this step, being happily debarred from bringing in a Bill themselves for the purpose; and they absolutely decline to pay any heed to the objections that petroleum legislation on these lines would have the twofold effect of considerably raising the price of oil to the public, and encouraging a false idea of the conditions under which such oil can be safely stored and handled.

It is scarcely necessary to repeat that the best expert opinion does not support this infatuation for a high flash-point, holding rather that the elements of safety in this connection cannot be reduced to this one requirement. Apparently tending to justify this opinion came the great Baku fire, which was an affair of petroleum residues, usually regarded as almost as "dead as ditch-water." We are indebted to the "Petroleum Review" for a valuable report of what has been done on the spot by way of investigating the origin and nature of the outbreak. A Committee of the Russian Imperial Technical Society was appointed to investigate the matter, and put the facts upon record. It was in this way established that the fire first broke out at the southern end of an open residuals bay belonging to the Caspian and Black Sea Company. It contained at the time 4¾ million poods of residuals. The surface area of the bay was 32,900 square feet; and when it was first seen to be in flames, only 280 feet of it were alight. This area rapidly spread. The Committee concluded that the fire could only have been caused by the addition of benzine or refined oil, purposely ignited. So far, there was no mystery about the conflagration. After the residuals had been blazing away for twenty-four hours, and the depth of liquid had fallen from 25 feet to 14 or 15 feet, there came a great overflow of the burning fluid; and in one place a large volume of steam and flame spurted up to the height of 70 feet, and scattered fire all around. In less than five minutes the whole surrounding district was well alight. This was what did most of the mischief and caused the greatest uneasiness; the mere burning away of an open tank of residuals counting for little or nothing in comparison.

A Special Sub-Committee of three local petroleum chemists and experts was therefore entrusted with the duty of making independent experiments aimed at the verification of the more plausible hypotheses framed to account for the overflow and geyser-like upheaval. The first hypothesis connected these phenomena with the presence of water, which was a recognized and natural fact in the circumstances. There is always a proportion of water in these refuse oils, which lies at the bottom of the bays. The average specific gravity of the mass of residues is 0·908, at atmospheric temperature. Supposing this mass to be ignited, a distilling action goes on, by which, in the first place, the lighter hydrocarbons are separated and burn, leaving what remains constantly getting heavier, as well as hotter. The heaviest grades consequently sink lower and lower, until they touch the layer of water. This eventually boils, forming steam, which is kept down by the superincumbent heavy and viscous mass of oils, until it attains a pressure sufficient to blow through this mass. Then what happens is governed by the character of the oils. If they are very heavy and viscous, the steam will cause a frothy overflow, which will come over the edge of the tank in a large mass. If and where the oil is of low viscosity, it will "blow" in the form of spray.

The foregoing seems rational. One experimenter sought to reproduce the conditions with solar distillate in glass vessels above a layer of water. When set on fire at the top, the formation of distillation products was distinctly seen, and the heavy residue fell to the bottom, with the result that steam was formed. Although the account is not so clear as might be desired, it seems that the hypothetical expectation was confirmed; the water being convicted of supplying the explosive force. In the absence of water, the oil burns harmlessly away. Another noteworthy observation was made, that where there is a good deal of bottom water, sufficient to absorb the heat slowly and not generate steam, there is no overflow or explosion. It is a small quantity of water that is mischievous. Therefore, in order to ensure the harmless burning away of an ignited oil-tank, the best thing to do is to add water, not on the top but poured in at the bottom. It is known that the transmission of heat downwards through water is a slow operation.

In practice, however, these heavy oil residuals, like carburetted water-gas tar, frequently contain a considerable quantity of water entrained with them so as almost to constitute an emulsion; and

one set of experiments was designed to test the effect of this condition in the event of fire. The mixture burnt with loud cracking noises, and usually ended by overflowing. On the whole, and after reviewing all the facts of observation and the experimental evidence, the Committee arrived at the conclusion that the cause of the overflow and eruption of the burning oil was to be found in the water present, partly entrained, and partly separated out at the bottom of the bay. No water was pumped into the bay during the fire. It was ascertained that at the beginning of the fire the condition of the contents of the bay was as follows: There was, towards the bottom, 15 feet of tarry material containing some water in suspension, while water had also separated out, and lay at the bottom. Above this tar floated 10 feet of light residuals, not containing any water worth speaking of. It was this water-free liquid that burnt harmlessly for 24 hours; and only when the fire reached the heavy and watery stuff beneath it, did eruption and overflowing take place.

Several reflections are suggested by this narrative, one of which is concerned with the question of the entrained and separated water which always exists in oil and tar tanks. It seems to be indicated that there should always be some water—the amount is put by one investigator at 4 per cent.—at the bottom of the tank. If there are means of pumping more cold water into this part of a tank, and extracting the warm water, the chances of a dangerous fire would be so far diminished. To throw water on the top of a blazing tank would be an act of madness. It is quite different, however, with steam. There should be little difficulty in smothering the flames of any ordinary oil or tar tank with live steam, simply turned in upon the surface without particular direction. It seems tolerably clear that when once a mass of oil is alight, the question of its flash-point ceases to possess any practical importance. The effect of mass in these cases is almost incalculable.

Evidently, it will never be safe for a gas manager to think that a store of solar distillate or any other heavy oil will not burn. It is suggested that where suspended water forms a higher proportion than 5 per cent. of the weight of the oil, the latter will not take fire. Perhaps not, if the mixture is uniform and the igniting flame or spark applied to it in this condition. The risk is increased, however, by the circumstance that such emulsions are never uniform; but are invariably richer in combustibles at the top. Here a film of volatile hydrocarbons is usually to be found; and it is quite possible that the outbreak at Baku may have had no more recondite origin than a lighted match casually dropped from somebody's "eternal cigarette" into this particular layer of inflammable oil.

COMPULSORY ARBITRATION IN TRADE DISPUTES

With the revival of labour disputes, which there is only too good reason to fear will be witnessed in the not distant future, there will doubtless be heard again the suggestion that legislation should be enacted in this country similar to that already in vogue in New Zealand, for the settlement of such disputes by means of compulsory arbitration. It is therefore well to refresh the memory from time to time as to how that system has been applied in the colony mentioned, and to note any fresh evidence as to the results of its operation. Briefly, the system is as follows: The colony is districted, and a Board of Conciliation appointed for each district—half the members being elected by the Trade Unions, half by the Employers' Unions, with a Chairman in addition chosen by the other members. To these Boards disputes can be referred by any registered Union of masters or men, or by an individual employer, provided his men are members of such Union. If the Board's decision be not accepted by both parties, the case is remitted to the Court of Arbitration, a tribunal composed of one member elected by the Employers' Union, one by the men's Unions, and a third appointed by the Governor in Council.

A Trade Union can always therefore get a case carried to the Arbitration Court (and can, moreover, by so doing, draw into that Court all the employers in the district engaged in the particular trade involved), and then demand a judgment on any question relating to the management of the industry. The award of the Court is enforceable by fine or imprisonment. In practice, it has been found that the Conciliation Boards are almost wholly ineffective—75 per cent. of the disputes being taken to the higher Court. As a means of conciliation, the Act is a failure; as a means of coercion of employers by Trade Unions, it is a complete success. Whether an employer considers an award just or not, he must obey or suffer the penalty; whereas to enforce penalties upon a Union is a far more difficult process.

We have recalled these particulars, given in fuller detail in an article on the subject in the "Journal" for Oct. 24, 1899, as a preface to commenting on an appeal to the Higher Courts of the colony, as to the powers vested in the Court of Arbitration, to which attention has been directed by a recent article in "Engineering," upon "New Zealand Labour Legislation." The appeal, we learn from our contemporary, was laid by the employers in consequence of an award of the Court of Arbitration, under which the employer was ordered to give preference in employment to men who were members of a Trade Union as against men who were not. That award, the employers contended, the Court had no power to make; but their contention was not upheld by the Court of Appeal, though the Chief Justice evidently disagreed with the law he was obliged to administer. The questions to be answered were: "Can the Court of Arbitration declare that non-associated workmen should only be employed if there are no workmen of equal ability and qualifications belonging to Unions or Associations? Can the employer be compelled to give preference to the Trade Unionists?" The Court of Appeal answered these questions in the affirmative. But in giving judgment, the Chief Justice said that "it was no doubt contrary to the principles of justice, on which Courts acted, that decisions affecting their rights and privileges should be given against parties whom the Court had not heard, and could not hear. If the words of the statute were plain, however, effect must be given to such a position. The statute must be obeyed, however contrary it might be to what was called 'natural justice.'"

Certainly, there is no need to argue the lack of any principle of justice in the statute. It is a staring, patent fact. A Company comes to loggerheads with the Gas Workers' Union; the Union appeals to the Arbitration Court, and the Company are then ordered, under pain of heavy penalties, to give preference in their employment to the members of the Union! Under such a law, the management of a business employing any number of workmen simply becomes impossible—a mere farce. The reins, to all intents and purposes, pass into the hands of the Trade Unions. But, as our contemporary remarks, the ultimate result must be to scare capital away from enterprises subject to the operation of such a law. The "horny-handed" are very fond of denouncing capitalists as something worse than criminals, and of speaking of capital as though it were the curse of labour. Well, under legislation similar to that from which New Zealand is suffering, labour will soon have an opportunity of showing what it can do (apart from tilling the soil) without the assistance of capital.

We do not know that there is any great reason to fear that any serious attempt will be made to introduce into this country the New Zealand system of settling trade disputes. But the example of our plucky little colony is so often held up to us by ignorant or foolish writers in the newspapers and magazines as one worthy of our emulation, that it is well to note, from time to time, what the results of the working of that system really are. Put briefly, they clearly amount to the absolute supremacy of Trade Unionism.

ELECTRIC LIGHTING MEMORANDA.

A Study of Sheffield—The Remuneration of Electricians—The Depreciation of Electrical Machinery and Plant—A Bad Example—Undertakings Living on Capital.

Our study for the week in electric lighting matters must be Sheffield, the City Council having devoted to this subject the larger share of their time at the last monthly meeting. The first electrical matter upon the *agenda* was a motion to reject the proposal of the Electric Light Committee to increase the salary of the General Manager and Engineer from £500 to £600. The question is interesting, as illustrating the contention, so often urged in the "Journal," that fair and honourable treatment of municipal electricians cannot but redound to the benefit of their colleagues of the gas department. The official whose remuneration was in question on the present occasion has just completed his first year's service under the Corporation of Sheffield, and the proposed rise was the very natural and proper mark of the Committee's appreciation of his work. This circumstance did not prevent a pair of City Councillors from raising an objection to it—of course, "on principle." Whenever there is a piece of meanness to be perpetrated, or a meritorious officer to be disheartened, somebody is sure to throw the cloak of "principle" over the suggestion. Happily, somebody else was ready on this occasion to propound another principle—that Sheffield could not afford to underpay its officials; and it went so.

This satisfactory piece of business done, the City Council proceeded to consider, on the motion of Mr. Hughes, a point raised by the Accountant Auditor in regard to the accounts of the electric light undertaking—namely, that no provision was made for the depreciation or antiquation of the machinery or plant. It was urged that, if this is the actual state of things, it would be wrong to pretend that the undertaking is profitable. In reply, Alderman Styring said that, although the accounts did not include an entry for depreciation, regard must be had to the fact that the machinery and plant are kept efficient out of revenue, and also to the provision that is being made for the purchase of the freehold of all the property belonging to the undertaking within 25 years. The Committee consider these arrangements equivalent to a depreciation allowance. Mr. Hughes still protesting, the Alderman went on to say that the surplus on the working of the undertaking has not been appropriated. It still remains in the business, and could be applied to any proper purpose.

Mr. Hughes had no difficulty in exposing the fallacy of this official gloss, which is common to most trading municipalities. It might be thought that the local magnates of a place like Sheffield would be the last to blink the essential difference between repairs and renewals of plant, as a charge upon current revenue, and the proper and necessary provision for the depreciation of machinery and plant in use. Yet here, as elsewhere, men of substance and leading in municipal affairs allow themselves to be persuaded into believing that corporation trading finance can safely be ordered upon different principles from those recognized and followed in private trade. The sinking fund blinds them to its own proper

purpose, and also to that of cognate but far from identical charges upon income. It would take too long to go into the former subject, of the whole purpose of the Legislature in making municipal loans repayable within a limited time; but it is chiefly with a view to prevent future generations of ratepayers from being burdened for the outlay of the present. This has nothing to do with the maintenance of the undertaking, for which the money was borrowed, in a profit-earning condition. The Legislature does not care about that. The borrowings of the Corporation are secured upon the rates, and so long as the interest and redemption are provided for, nobody outside cares whether a particular commitment is represented by an asset or not.

It was mentioned in the Birmingham City Council the other day, that the City as yet possesses only one small piece of freehold property—that is to say, only in respect of one particular subject of a Corporation loan had all the payments been completed. This Corporation are still paying for a piece of tramway that has long disappeared from the face of the earth. Probably most other Corporations, including that of Sheffield, have similar records. This consideration alone exhibits the difference between a sinking fund and a depreciation fund. Neither can repairs and plant renewals out of revenue compensate for the lack of such provision. Patch as long as one may, the time comes when in the interest of economy the whole plant ought to be "scrapped." Private manufacturers are constantly acting in this way; but municipalities are afraid to provide themselves with the means of doing the same. In the case of Sheffield the only excuse is that offered on the part of the Committee—that the amount of the disposable profit on the electric light undertaking is kept in hand, and not disposed of in any way. The excuse is a bad one, because unappropriated profits have a way of becoming allocated without respect to unsatisfied internal charges. Sir Charles Skelton frankly confessed that if a depreciation allowance were made, the account would show a working loss, and asked if that was desirable. The only answer is, "Certainly; if it is honest." What is the good of making believe that a business is being carried on at a profit, if it is living on the capital? Did a fictitious profit ever satisfy anybody in the long run? Some of the members of the Corporation seem to think that to extend the mains out of revenue is as good as a depreciation fund. They will live, it is to be hoped, to learn the truth of this matter, although the lesson will not be a pleasant one. Rapid main extensions sounds like "progress;" but Manchester has already had enough of this kind of progressive game.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1680.)

THERE was not much increase of activity apparent in the Stock Markets last week; and even the extreme cheapness of money was powerless to galvanize them into life and movement. But the tendency was quite bright and buoyant, largely owing to the improved prospects of an early peace having a cheerful influence. Prices in general are better all round. The settlement was negotiated without difficulty. A surprise cropped up in the Money Market when on Thursday the Bank of England rate was reduced to 3 per cent. from the 3½ per cent., which was only a week old. Rapid changes are generally to be deprecated, as they not unfrequently produce fluctuations which are inconvenient. Business in the Gas Market did not quite attain the volume of the preceding week, and on some days it was decidedly quiet. Movements were irregular and undecided, stocks being put down one day, and then put up again a day or two later, and some of the movements either way are not easy to account for. On the whole, the downward changes are more numerous than the upward. But probably they do not mean much; and the tide this week is just as likely as not to be in the other direction. In Gaslight issues, the ordinary opened rather depressed from the close of the previous week, and fell a point on Tuesday; but on Friday it rapidly recovered and was put up again, and marked 96½ on Saturday—the best of the week. The secured issues were rather weak, especially the preference, though it avoided an actual fall. South Metropolitan was very quiet, and gave no sign either way. In Commercials, a parcel of old stock was thrown on the Market "specially," and lowered the quotation. This was rather an ill-timed operation, as it was no secret that the Directors intended to lower the price of gas at Midsummer. They now announce the substantial reduction of 4d. per 1000 feet, which will authorize an increase of 1 per cent. in the dividends thenceforth accruing. The Suburban and Provincial group were almost lifeless; but Brighton "A" was lowered. In the Continentals, Imperials were put down on Wednesday, and put up again on Friday; but prices remained rather poor all the time. The Water Companies in general were weak; the reduced dividend depressing Southwark.

The daily operations were: Very moderate business was done in Gas on the opening day; and quotations did not vary. In Water, both Southwarks fell 5. There was a little more life on Tuesday; but things were flat. Brighton "A" receded 3, Commercial old 2½, ditto debenture 2, and Gaslight ordinary 1. Wednesday was much the same. Imperial relapsed 1. Thursday was a busier day, without change in prices. Friday also was more active. Imperial rose 1½, and Gaslight ordinary 1. In Water, Kent fell 8½, and New River and Southwark 2 each. Saturday was steady in gas; and Melbourne Bonds gained 1. In Water, Chelsea fell 2; but New River debenture advanced 2.

OBITUARY.

We regret to record the death, last Sunday morning, of Mr. W. L. ROBINSON, of Coventry. Deceased was one of a family who may truthfully be characterized as pioneers in the gas industry; his father and uncle being at one time lessees of the Leicester, Nuneaton, Coventry, and Leamington Gas-Works, while he himself was for some years the Manager at the two last-named establishments. He has of late been known to the gas world more particularly as a member of the well-known firm of tar distillers, Messrs. Robinson Bros., of West Bromwich, Knottingley, and Spondon. His connection with the gas industry was not, however, entirely severed, as he filled the position of Vice-Chairman of the Leamington Priors Gas Company. Mr. Robinson was generous to the extreme; and his loss is one which will be felt by many.

By the death last Saturday, at Ventnor, of Mr. WILLIAM MEDHURST, the Folkestone Gas Company have lost the services, which extended over a long course of years, of their Manager and Secretary. Mr. Medhurst joined the Company, of which at one time the late Editor of the "JOURNAL," Mr. T. G. Barlow, was the Consulting Engineer, in a subordinate capacity; but he displayed qualities which attracted the notice of the Directors, and, by degrees, he was entrusted with the practical control of the concern. Deceased joined the British Association of Gas Managers in 1872; but he was not a conspicuous member, either of that body or of the Gas Institute. It may truly be said of him that his interest was centred in the undertaking with which he had been so long associated. Of late years he had been assisted in the secretarial duties by his nephew, Mr. William Griffin.

The Manchester Corporation Gas Department have recently lost, by death, two old and valued officials—Mr. T. C. LEVER, Collector of Miscellaneous Accounts, and Mr. WILLIAM RODGER, the Manager of the Bradford Road Gas-Works. Mr. Lever, who died on the 31st ult., had been in the service of the Gas Committee for upwards of 45 years. He was appointed a meter inspector in 1856, a fittings inspector in 1864, and was raised in 1877 to the position he occupied until his decease at the age of 72 years. He had the full confidence of the Gas Committee, and the esteem of his superiors and colleagues in office, as well as of a large circle of friends. Mr. Rodger, who died on the 12th inst., aged 72 years, had been in the service of the Committee for more than 40 years, having commenced as a stoker at the Rochdale Road Gas-Works in 1861. After being for some time temporary retort foreman, he was in 1869 confirmed in this position, and in 1876 he was made head foreman of the carbonizing department. In 1878 he was appointed Deputy-Manager of the Rochdale Road works. In July, 1889, he was transferred, as Acting Manager, to the Bradford Road works, and in 1897 was appointed Manager. During the ever-memorable gas strike of 1889-90, Mr. Rodger rendered good service in obtaining men to fill the places of those who so foolishly struck, and in reorganizing the work and securing success. Again, at the time of the lamentable accident by which Mr. G. E. Stevenson, the Engineer, lost his life, Mr. Rodger was placed by the Gas Committee in charge of the Rochdale Road works; and during that anxious time he never spared time or trouble to overcome the difficulties, and avert further disaster. In him the Gas Committee have lost a faithful servant, and his colleagues in office and the men under him a true friend.

It is with feelings of sincere regret that we record the severance of another link connecting the present with the past of the great industry with which the "JOURNAL" is identified. On Saturday morning last there passed away, at his residence in St. John's Wood, at the advanced age of 82, Mr. FREDERIC LANE DERBY LINGING, for 38 years Secretary of the British Gaslight Company, Limited, and until a few years since Chairman of the Crystal Palace District Gas Company. Mr. Linging resigned the former position in the spring of 1897, and was granted a retiring allowance. None of those who were present at the meeting of the Company at which the Chairman (Mr. Horsley Palmer) referred to their late Secretary's life-work for the undertaking, and the testimony borne to his work by Mr. George Livesey, from the shareholders' side of the table, will readily forget the scene. Mr. Linging was then in his 79th year; and, in relinquishing the duties he had so long discharged, he said he felt that the time had come when, in the Company's interests, a separation which was necessarily painful to him had become necessary. In the course of Mr. Livesey's remarks, he suggested that it would be gratifying to the shareholders to see Mr. Linging upon the directorate; and the Board acquiesced in this view by electing him a member early in the following year. Mr. Linging's connection with the Crystal Palace District Gas Company extended over many years. He was Deputy-Chairman for some time, and then, on Mr. H. Palfrey Stephenson relinquishing the chair in 1888, he stepped into the higher position, and held it down to the spring meeting of the Company in 1894. This was the last occasion on which he presided; the chair being taken at the August meeting by Mr. George Livesey, who announced that his friend had retired in his favour, but that the shareholders would still have the benefit of his valuable advice in his capacity of Director. Mr. Linging was also upon the Boards of the Bombay and Lea Bridge Gas Companies. The health of the venerable gentleman had been failing for some few months; and he gradually succumbed to the infirmities which usually accompany old age. He leaves behind him, however, a good name, and "troops of friends," by whom his memory will long be cherished.

A "NEEDFUL" EXPLANATION.

INCLINED RETORTS.

An Advertisement has been running in these Columns for a considerable period warning the Trade generally against Infringing the Patent Rights of the **NEW CONVEYOR COMPANY OF BIRMINGHAM.**

An action was instituted by that Firm against **THE BRIGHOUSE CORPORATION** in the High Court of Justice asking for an injunction restraining them from Infringing their alleged Patent Rights.

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NOTES.

American Paint Manufacture.

An interesting consular report on the paint trade in the United States has been issued by the Foreign Office. It is stated that in no country in the world is there so large a consumption of paint as in the United States, owing to the universal use of wood for buildings, which require constant repainting in order to preserve them in a trying climate. The competition in supplying this demand is very great; and the machinery for crushing, grinding, and mixing the pigments is of a very high class. There is no deposit of chalk in the United States satisfactory to the paint and putty manufacturer. American whiting, or carbonate of lime, is limestone, not chalk; consequently this base has to be imported from Great Britain. Most of the best and strongest pigments are also imported. Sublimed white lead paint is manufactured directly from a native lead sulphide, and mixed with zinc white, is stated to be an excellent under-water paint for iron. Marble dust is largely used as a paint component. It comes from a quarry that has not yet produced good block marble, so the stone is crushed and ground to a very fine powder. Samples of these American paints are on view at the Board of Trade show rooms, No. 50, Parliament Street.

Investigating Lightning Strokes.

It is stated that the Royal Institute of British Architects and the Surveyors' Institution have organized a Joint Committee, named the Lightning Research Committee, with the object of collecting and tabulating information from all parts of the country as to damage resulting to buildings from lightning stroke. The formation of the Committee is due to the representations of Mr. Killingworth Hedges, who read a paper before the Royal Institute last year, in which he laid stress upon the difficulty experienced by specialists in the subject in collecting accurate information as to damages caused by lightning. Without this access to the facts, of course, students of the matter must work in the dark. Nothing in the way of an authoritative census of lightning strokes has been attempted since the publication, in 1882, of the report of the Lightning Rod Conference, which has remained the text-book on the subject ever since. Mr. Killingworth Hedges is the Hon. Secretary of the new Committee; and persons who are willing to co-operate in the collection of reliable information are invited to communicate with the Committee, who will furnish a schedule of questions to be answered by local investigators. It is to be hoped that attention will be given to the effect of lightning upon gas-fittings.

A Mercury Vapour Incandescent Electric Lamp.

Another type of electric lamp is being prepared for the market, models of it having been shown a few weeks ago to the American Institution of Electrical Engineers. It is the invention of Mr. Hewitt, an American electrician; and the laboratory form of the lamp is credited with an efficiency ten times greater than that of the ordinary incandescent lamp. The principle of the Hewitt lamp is the incandescence of mercury vapour contained in a long glass tube. In the models shown, the tubes were from 2 ft. to 4 ft. long, and 1 inch in diameter. Their efficiency was exceedingly high, one 3-feet tube developing 400 candles illuminating power, from the same consumption of energy that would maintain in action four 8-candle power lamps. The light is not a pleasant one, being practically devoid of red rays. The idea of a mercury vapour incandescent lamp has been tried before, and the same unsatisfactory character of the light was recognized. In order to remedy this defect, various substances are introduced into the mercury, with the object of colouring the incandescent vapour. The device has not yet proved successful; but the admittedly high luminous efficiency of the lamp—from three to five times greater than the carbon arc—encourages further endeavours to make it a practical and a pleasing light.

Preservative Coating of Cast-Iron Pipes.

In the course of an interesting account of the manufacture of cast-iron pipe in the United States, the Special Commissioner of the "Engineer" describes the method in use for coating water-mains with a preservative, which is now usually coal tar. The cleaned pipes are run into a heating-chamber, where they are uniformly warmed to a temperature of about 500° Fahr. It is considered in some foundries that the pipe ought to be hot enough to "fry" the tar on the surface after it is withdrawn from the bath. The pipe remains in the bath from 5 to 10 minutes. Some specifications prescribe a second dipping. The surplus tar is drained off, and the coating should dry hard and adherent to the metal. The dipping fluid is gas tar simply heated sufficiently to expel water and the lighter constituents. The pipe is expected to fume freely on emerging from the tank. Fresh tar is added regularly, and the tank is cleaned out at intervals. This process is still commonly referred to as the Angus-Smith preservative process; but it is not the same. Under the original Angus-Smith prescription, the pitch bath was heated to 300° Fahr., and the cold pipe was plunged into it and kept long enough to attain this temperature, which took nearly half-an-hour with a large pipe. The temperature was also very near the boiling point; so that there was always risk of the bath boiling over. The coating is not now done in this way, the pipe being previously heated and the period of the dip shortened. Creosote oil is sometimes added to the bath to thin it; but this is unnecessary if fresh tar is regularly added.

Features of Coke Manufacture in the United States.

Mr. W. G. Irwin has explained, in the "American Manufacturer," the comparative slowness with which products recovery coke-ovens have extended in the United States. It is ten years since the first batch of twelve Semet-Solvay ovens was successfully installed at Syracuse, New York. These were followed by others in Western Pennsylvania; and plants on the Otto-Hoffman system were also constructed in the same region. All this happened three or four years ago, and since then there has not been any great extension of the kind of plant, especially into the Connellsville region. It is stated that the slow progress made by these improved systems of coke making is not attributable to the indifference of the coke manufacturers of the district. The trade is so flourishing, that makers are under no temptation to submit to the trouble and loss attendant upon a change of manufacturing methods. The new system may be more economical; but the manufacturer does very well without it. This is especially true of the Connellsville region, where the coal raised is perfect for coking. Where the coking properties of the coal are not so great, the bye-product ovens have an advantage. Their chief prospect, however, seems to lie in the shifting of the scene of the coking industry from the coalfields to the great iron manufacturing centres. It is found to be advantageous to make the coke where it is to be used; and where the residuals are recovered, this more than recoups the trade for the extra cost of carriage of the raw coal as compared with coke. Besides, in the extended use of coke instead of raw coal, a means of escape from the smoke nuisance is indicated.

COMMUNICATED ARTICLES.

OPTIMISM AND PESSIMISM AS TANGIBLE BUSINESS FACTORS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

(*Concluded from p.* 1570.)

Apart from other considerations, it is a great advantage to the promoters if an enterprise is new, in the sense either of introducing some decidedly novel article, or an entirely fresh departure in the application of a previously known agent. There is always a demand for novelty. People not only like to hear, or to tell, of some new thing, but to buy it and use it. Whether it is a new colour or shape in neckties, a new cut in hats or coats, a new brand of cigars, or anything else, the result is the same; and anyone who introduces a new agent for artificial light may count upon a certain number of customers, apart from any question of intrinsic merit or value. With regard to electric lighting, I have heard a gentleman of some experience in starting electric light undertakings say that the charm of novelty is a very decided help at first; but that after about two years, it wears off The proprietors of hotels or places of amusement, the authorities at fashionable resorts or seaside towns, and many others are open to take up any novelty which is likely to come within the sphere of a "nine days' wonder" as a topic of conversation, and to attract visitors. This is all very well for a cheap-jack system of business; but it will not do for a permanent investment, requiring equally permanent lines of sales. The man who opens a new shop runs a larger business for the first month than he will command as a permanency; and it is the usual experience with gas companies that a considerable number of their customers, after trying electric light for a few months, give it up and return to gas. The more energetically the district has been canvassed, the more marked is this result. Canvassing can be carried too far, by over-persuading weak or vacillating people who really do not want the article, and therefore throw it off on the first excuse; or by over-zealous enlargement upon the advantages, to the exclusion of defects or drawbacks, leading the prospective customer to expect too much. If the performance does not come up to the promise, a feeling of annoyance or disgust is created.

The novel enterprise possesses another decided advantage of a different kind. A new broom sweeps clean, and an entirely new electrical installation may be expected to run in much better trim while each part is fresh than when it settles down into everyday work, and the item of repairs and maintenance, at present practically *nil*, begins to assume normal proportions. Any concern started with an absolutely clean capital account, free from encumbrances of buildings and machinery that were perhaps of the best possible kind at the time of erection, but have long ceased to have any claim to that position, or from the gradual accumulation of misfortunes, mistakes, and perhaps mismanagement, which is the invariable result of fifty or sixty years' working, is for the first few years of its life in an exceptional position. The plant belonging to the average gas company has long ago shaken down into normal working condition; and the outlay on repairs and main-

tenance is as large as the appropriation for dividends. If the existing plant could be completely cleared away, and the capital account fully liquidated, so as to admit of an entirely fresh start, and a new plant was erected on the latest improved lines to take the place of the old, one can easily imagine that the working expenses—especially for the first year or two—would run very low. In order to get a fair comparison with electric light undertakings, it is necessary to consider all these points; and the idea of comparing the working costs of an entirely new electrical undertaking with a gas-works that has been in existence for fifty years, with a view of getting at the comparative cost of gas and electricity, is as unjust as the no less frequent practice of comparing a new electric lamp of the latest make with an old-fashioned gas-burner in an indifferent condition as regards preservation. In ten years' time, the number of electric lamps in circuit will not be the figure arrived at by totalling up the additions claimed to have been obtained in each year, but far below it; and the working expenses, at present considerably like the play of Hamlet with the principal character omitted, will be very different, as municipal authorities who are led to purchase upon terms based on the working results of the first year or two, will find to their sorrow.

Against these advantages, which the electric light has enjoyed in common with all decidedly new enterprises, we may be reminded that the business takes time for development, the capital invested must of necessity be in excess, and the annual turnover in proportion thereto is not so large as may be expected at a more advanced stage. But, as a rule, due prominence is accorded to these drawbacks; while the other side of the question is kept in the background. One often hears of the difficulties, but rarely of the advantages, attendant upon a start *de novo*, whether as regards new customers or working expenses.

Mr. Ashworth has two remedies to suggest—giving away mantles, and an alteration in the price and quality of the gas supply.—I take it that the ultimate object of all proposed reduction in quality is a more than proportionate reduction in price, and that the consumer will receive better value, so far as heat units are concerned, than he does at present. With regard to mantles, several gas-works managers have already recognized that, if a large business is to be done in incandescent lighting, the gas company must take up the question of maintenance; and those who at present hold aloof from this new departure, will at a later period regret their hesitation. As to any important alteration in the quality of gas, such a step is decidedly premature. The flat-flame customer is not everybody, but he is still a power in the land. I do not go so far as those who claim that he is substantially the representative of gas lighting, and that users of the incandescent light are not sufficiently numerous to present any reasonable claim for consideration, or who would legislate for the flat-flame only, after the manner adopted by the advisers of the London County Council, who are apparently troubled by the delusion that they will be furthering the interests of the consumers by forcing the gas companies to send out 19 to 20 candle power gas. But to compel consumers to change their burners, or to neglect their views entirely, is to go to the other extreme. There is no proof that straight 16-candle gas is played out. The worst that has been urged against it is inability to hold its own, alone and unaided, against other illuminating agents that are assisted by canvassing, advertising, personal influence, and every available means. Notwithstanding the inroads of other articles, there is still a large section of the public accustomed to a good 16-candle gas, not only in respect to its lighting, but also to its heating powers, and who would not take kindly to any important alteration in quality. I am writing these lines under a Sugg table-top burner in a Christiania globe, which gives a soft, agreeable light that is hard to beat; and many others like appliances of this sort, and will continue to use them.

In these days of voluminous literature, when the ordinary weekly issue of the "JOURNAL" runs out to over sixty foolscap pages, it is difficult for a busy man to keep up his reading, and to remember all he has read. But is not the present information about 10-candle gas rather vague; being chiefly confined to descriptions of how it works in Germany, with different materials and under different circumstances to those obtaining here? One would like to see something official as to the cost of manufacture under ordinary everyday working; and till this is forthcoming one may well be pardoned for being a little sceptical as to where the margin for large economy comes in. It will cost as much to condense, purify, store, distribute, and sell a million cubic feet of 10-candle as of 16-candle gas. Already the net manufacturing cost of 1000 cubic feet of 16-candle gas is in many districts a matter of coppers only; and if 10-candle gas is to be sold substantially cheaper, it will be necessary to follow the lead of Dr. Ludwig Mond, who claims to have converted the so-called manufacturing costs into a *minus* quantity. With regard to the South of England, we must remember that the cost of carriage is the same, whether the material transferred is the cheapest inferior slack or the best quality cannel coal. At the gate of the colliery, the proportionate cost may be respectively 5s. and 10s., showing a 50 per cent. saving in favour of slack; but add 10s. for carriage to each, and we get 15s. and 20s., or a reduction of the saving to 25 per cent. Altogether, instead of throwing up the sponge on behalf of 16-candle gas, it seems desirable to try what can be done by trade-pushing, advertising, and canvassing.

Giving away mantles scarcely meets the objections to the incandescent gas-light. Unless the consumption of mantles is abnormally large, the cost of them is not so much an objection as the trouble of fixing, adjusting, keeping the burner clean, &c. A liberal supply of mantles, used carelessly and indifferently, is not likely to satisfy either party concerned. Send round a competent and experienced official to see that the burner is in good order, the air-passages clear, the gas supply rightly adjusted, and the mantle properly centred, and the result will be so satisfactory that the consumer will soon learn, for his own sake, to avoid carelessness and rough usage, and will at the very least be willing to pay the cost of the mantles. If gas consumers are not aware of the fact that the incandescent gas-light, including reasonable maintenance charges, is not only very efficient but by far the cheapest light extant, whose fault is it? If anything like a similar advantage could be offered by other agents, the public would know it. In almost every street there are "frightful examples" of dirty, neglected incandescent gas-lights; and the way to meet this disadvantage is to introduce a workable maintenance system, which secures good shows of incandescent lighting all over the district. On this point, I am not working on theory or speculation, having taken up such a system some two years ago; and at the present time, in a small district of 16,000 inhabitants, I have a staff of five men exclusively engaged on maintenance work. Even in a district of this size, there is room for the services of a suitable inspector or canvasser, to go in and out among the customers, pushing the use of new appliances, and seeing that they are a success. A well-educated gas-fitter, of good address, who has studied the subject theoretically as well as practically, could do the work; and he should not be tied down by cast-iron rules, or allowed too much authority. All agreements should be subject to the approval of the manager or secretary, who may personally supervise the work, and give attention to any special cases. Here are a few examples of what can be done.

1.—In almost every district there are sure to be several churches or public halls lighted by pendants carrying star or corona lights. In one case a church was lighted by eight pendants in the body and four in the chancel, each carrying four *fleur-de-lis* burners, and representing on the whole 144 No. 3 flat-flame burners. It was pointed out that these might be advantageously replaced with 48 Welsbach lights; and when the cost of them was objected to, a seven years' hire-purchase and maintenance scheme was proposed, which enabled the authorities to get the immediate benefit of improved light, without any initial cost, and without increasing their liabilities, as the saving of gas will be sufficient to pay the hire-purchase and maintenance charge. The cost of maintenance of incandescent gas-lights in a place of worship is a mere trifle. The installation having been fixed, the inspector must be present on the occasion of the first few times of using, to see that the attendants understand the lighting and adjusting. After he has given a few practical examples of efficient lighting, the authorities will be so satisfied that no further trouble is likely to arise. The system, once fixed, must not be left to take its chance. A little defect, due to excessive pressure or insufficient supply, which could easily be set right, may secure the condemnation of the whole, if neglected. One or two installations started in this way act as advertisement, and soon lead to more business.

2.—In every hotel or club there is some trouble with the ordinary flat-flame arrangements for lighting the billiard table. Eighteen No. 4 flat flames over each table serve to increase the gas bill, and create complaints about the heat and vitiated air; and the light is not always steady. A competent inspector, taking one of these tables in hand, replaces the flat flames by one-third the number of incandescents, with anti-vibration arrangements, and secures an absolutely perfect light, which satisfies the landlord and his customers, and, as in the previous case, soon leads to further business.

3.—Here is a large, but low, shop, having barely 9 feet between floor and ceiling. The proprietor tells us he cannot use gas in the windows owing to the heat, and perhaps because of its effect on goods suspended from the ceiling. This case need not be despaired of; for there is room for a good set of outside lamps that will efficiently illuminate the goods in the windows, and at the same time leave the same perfectly clear and free from risk of fire. A similar plan will probably find favour with stationers, haberdashers, and others who exhibit light inflammable goods.

I know the above proposals will be objected to by some who hold old-fashioned business ideas. It will be urged that in the case of substituting incandescent lights for clusters of flat flames there is a loss in the form of a reduced consumption, and an addition to the expenses. To those who hold such views, Mr. Ashworth's utterances may be accepted as correct; for there certainly will soon be an end to the old-fashioned ways of selling gas. But this is quite another thing to saying that the consumption of gas will diminish. The missionary in one of Artemus Ward's stories, when told that he was bound to have a severe thrashing, and offered the chance of taking it quietly or fighting, decided that, as there was no chance of avoiding it, he would take it fighting, and accordingly did most of the thrashing himself. The most conservative of gas managers, when it comes to a case of self-preservation, will take up most modern business methods. Many held out obstinately against letting stoves on hire, saying it was better to sell at 33⅓ per cent. profit. So it is, provided you can get a brisk trade on these terms. Many held out against even

laying a service free. But the majority have accepted the inevitable, and recognized that the selling department must not be left to take care of itself, and that there must be a more intimate contact with the consumer than has obtained in the past. The lighting business of the future, whoever secures it, will not fall to the lot of the supplier who sits at his desk waiting for customers to come, and, when they do come, makes sure of a good old-fashioned $33\frac{1}{3}$ per cent. profit on every step he may take. The rapid increase in the consumption of gas during the last few years is chiefly due to a growing appreciation of these facts, and warrants full faith in the future of our industry—not spurious optimism assumed as the best course available for making the most of a losing job, but real genuine belief in the ability of gas, when properly backed up, to hold its own against all rivals.

FURTHER NOTES ON PURIFICATION OF GAS.

By S. CARPENTER, of East Ham.

(*Continued from p.* 1054.)

In testing for sulphur according to the method already described, the author found that the difference in the results obtained, due to variations of the thermometer and barometer, was so small, that, to save time, he did not trouble to make the correction. For example, with the thermometer at 60° Fahr. and the barometer at 30 inches (the standard temperature and pressure), of course, no correction is required; but if the temperature falls to 52°, and the pressure to 28·1 inches, the tabular number is 0·955. The result of the sulphur test being 12 grains per 100 cubic feet, it would be increased to 12·5 grains—a difference of half-a-grain. On the other hand, supposing the barometer remains at 30 inches and the thermometer falls to 46°, the tabular number is 1·025, and the sulphur is, as before, 12 grains. This would, by correction, be decreased $\frac{1}{2}$ grain, making 11·5 grains. The question then arises whether it is worth while to waste valuable time for nothing.

As a comparison between the method of testing previously described and the boiling process as prescribed by the Gas Referees, I have made a series of tests by both methods upon the same liquid resulting from a sulphur test under precisely similar conditions. The following figures show the closeness with which the results approximate:—

Referees' Method.	Carpenter's Method.
13·5 grains per 100 c. ft. of gas.	13·9 grains per 100 c. ft. of gas.
13·7 " " "	13·2 " " "
13·2 " " "	13·2 " " "
14·4 " " "	14·9 " " "

It will be seen by these figures that the average of the latter method is slightly higher than the former; showing that the cold process tends to extract the sulphur to the utmost extent rather than otherwise, which, it will be admitted, is a merit.

By using what I have called the "cold" process, and also my table, the necessity for any calculation on the part of the operator is obviated; and as the figures have been carefully worked out, they may be depended upon for accuracy. For the benefit of those who may read this article, I have prepared a synopsis of the table, and by observing the quantity of gas consumed in the test, upon reference to it the number of grains of sulphur contained in 100 cubic feet may be ascertained. It is intended more especially for the use of those gas examiners who are not qualified chemists, or who, owing to want of time and pressure of other duties, are desirous of simplifying the process of testing.

Cubic Feet of Gas Burnt.	Grains of Barium Sulphate Obtained in the Test.														
	0·1	0·2	0·3	0·4	0·5	0·6	0·7	0·8	0·9	1·0	1·1	1·2	1·3	1·4	1·5
5	2·40	4·80	7·20	9·60	12·00	14·40	16·80	19·20	21·60	24·00	26·40	28·80	31·20	33·62	36·00
7	1·72	3·44	5·16	6·88	8·60	10·32	12·04	13·76	15·48	17·20	18·92	20·64	22·36	24·08	25·80
8	1·50	3·00	4·50	6·00	7·50	9·00	10·50	12·00	13·50	15·00	16·50	18·60	19·50	21·10	22·50
9	1·33	2·66	3·99	5·22	6·65	7·98	9·30	10·64	11·97	13·30	14·63	15·96	17·29	18·60	19·93
10	1·20	2·40	3·76	4·80	6·00	7·20	8·40	9·60	10·80	12·00	13·22	14·40	18·62	16·80	18·00

A little explanation of this table will not be out of place. Supposing 5 cubic feet of gas have been consumed in the sulphur test, and 1000 grains of the liquor have been analyzed, and 0·1 grain of barium sulphate obtained in the test, upon reference to the table, under 0·1 grain, the figures 2·4 will be found, which will represent 2 grains and 4-10ths of a grain of sulphur in 1000 cubic feet of the gas tested. Then 7, 8, 9, and 10 cubic feet are worked out in the same way as 5 feet, according to the quantity of barium sulphate found in the test.

Where gas has to be tested for carbonic acid and sulphuretted hydrogen, two test-cocks are used in each purifier—one being fixed in the middle of the vessel, just above the second tray of lime, counting from the bottom, and the other in the cover. The gas should be tested twice a day by lime water at each of these cocks for carbonic acid. The gas should be passed through oxide of iron in a small hand purifier, to remove the sulphuretted hydrogen, before being tested. If this is not done, the test will lead the operator astray, as lime water will take up a portion of the sulphuretted hydrogen, and this will turn it a brown colour, so that it would not show the presence of carbonic acid so quickly. Take a small quantity of lime water in a beaker, and let the gas bubble through it for about three minutes. If there is any carbonic acid in the gas, it will make the water become milky. There is no need to test for sulphuretted hydrogen at the first lime purifier, because we know it is there; but testings should be made for it at the second lime purifier, both at the middle and at the outlet.

When testing gas for sulphuretted hydrogen, it must not pass through oxide of iron. It should be tested by letting a stream blow upon a piece of paper moistened with acetate of lead. Should sulphuretted hydrogen be present, the gas will turn the paper a brown colour in a quarter of a minute. It is necessary that the gas should be tested for sulphuretted hydrogen to ascertain if there is sufficient in the gas to keep the lime in the second purifier in a state of hydrogenated sulphide of calcium, which has the power in a high degree of absorbing bisulphide of carbon. The gas should be tested for bisulphide of carbon at the inlet and the outlet of the first purifier, and also at the outlet of the second lime purifier. The results will give the number of grains of the impurity in 100 cubic feet. If the percentage of carbonic acid and sulphuretted hydrogen is required, the gas must be tested by the eudiometer, which has already been explained.

(*To be continued.*

According to a telegram from New York, Mr. Strowger, of Rochester, has just invented an electrical storage battery which he claims is better than Edison's. It is stated that it can be charged in half-an-hour to an amperage so great that it would melt any description of storage battery now in use. The same gentleman is credited with having also discovered a new gas similar to acetylene, but less dangerous. The materials used in its composition are said to be of the simplest character, and the residuals more valuable than the gas itself.

The New Gas Manager for Larne.—Mr. Nicol Allan, who has been trained in the Dumbarton Gas-Works, under Mr. J. M'Gilchrist, has been appointed Manager of the gas-works at Larne. Before leaving to take up his duties, he was presented with a marble clock, together with a keeper-ring for his wife.

Southern District Association.—As already announced in the "JOURNAL," the spring meeting of the Association will be held at Bournemouth next Thursday. We learn from the programme issued by the Hon. Secretary (Mr. J. W. Helps, of Croydon) that the London district members will leave Waterloo Station at 9.30 a.m., arriving at Branksome about one o'clock. Lunch, kindly provided by the Directors of the Bournemouth Gas and Water Company, will be served at the gas-works, after which the works will be inspected. At three o'clock coaches will be in attendance to convey the members to the water-works of the Company, at Alderney. The party will afterwards proceed to Longham, where tea will be served at the invitation of Mr. Corbet Woodall, the President.

Masonic.—As customary, when the Gas Institute are in London for their annual gathering, an Emergency meeting of the Evening Star Lodge was held at the Holborn Restaurant on Monday evening last week, under the mastership of Bro. W. D. Child, P.P.G. St. B. Essex. The Wardens' chairs were occupied by Bro. Arthur Valon, of Ramsgate, and Bro. A. E. Broadberry, of Tottenham. About 120 members of the Lodge and visitors from the provinces attended. Mr. John Hammond, the Manager of the Eastbourne Gas-Works, was initiated in the course of the evening; and the only other "business" was the offering of the fraternal greetings of the Evening Star Lodge to the provincial brethren attending the meeting of the Institute. At the close of the lodge, there was a banquet; and subsequently a smoking concert, when the Meister Glee Singers gave some of their well-known glees. Solos were also contributed by Miss Edith Serpell and Miss Florence Venning.

The Self-Intensifying Kern Lamp.—During the meeting of the Gas Institute last week, the Welsbach Incandescent Gas-Light Company had on view in Niagara Hall, Westminster, a number of their new self-intensifying lamps; and many Institute members took advantage of the opportunity thus afforded of making an inspection of the invention. There were in all eight lamps running—five singles and three three-light clusters. Two of the latter were for column lighting, and one for interior use. A variety of lanterns were employed, in order to show that the system can be applied to lanterns of diversified character. The visitors generally appeared pleased with the light, and particularly with the simplicity of the arrangement. Of course, in the daytime, though the hall was darkened, the lamps were not seen to best advantage, besides which the pressure of the gas during the light hours of the days was not equal to more than 15-10ths. Examples of the lamps may be seen alight at night time in Trafalgar Square (at the base of the Nelson column, two in Bridge Street at the top of Whitehall, and one in the Broadway, Westminster. A descriptive article on the lamp appeared on the 4th inst.

TECHNICAL RECORD.

NEW TEST FOR SULPHUR IN BENZOL.

At a recent Meeting of the Manchester Section of the Society of Chemical Industry, Mr. Wilfrid Irwin submitted a paper descriptive of a new test for sulphur in benzol, for use in gas-works. The following is the text of the paper, as given in the "Journal" of the Society:—

It is now about five years since benzol was first employed as an enricher for coal gas; and at the present time, for various reasons, its adoption has become very extensive. An objection has been raised to it owing to the fact that, if not properly prepared, it may contain sulphur; and, as it is a great convenience to apply the enricher to the gas after purification, it is clearly advisable that the product should be as free as possible from such an impurity. All commercial benzol contains sulphur in some proportion; but 0·4 per cent. should be considered a maximum to be allowed, and this ought to be reduced if possible. One gallon of benzol per 10,000 cubic feet of gas is a common quantity to enrich with; and if this contained 1 per cent. of sulphur, an addition of 6·1 grains of sulphur per 100 cubic feet would be the result. With 0·4 per cent., my suggested maximum, the result would be an addition of 2·4 grains per 100 cubic feet.

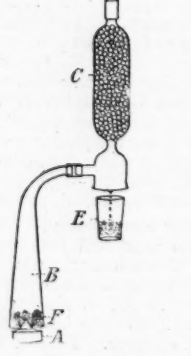
Sulphur exists in commercial benzol in several different combinations: (1) Carbon bisulphide; (2) mercaptans; (3) thiophene, thiotoluene, &c. In the case of a very bad sample, the sulphur is usually present principally as bisulphide of carbon; but where the quantity of total sulphur is below 1 per cent., the thiophene often exceeds in amount that of the bisulphide.

The usual methods employed for the determination of sulphur in benzol are or have been: (1) Heating the benzol in a sealed glass tube with ammonia and ferric chloride, as described by Holland and Philips; (2) the potassium xanthate method, as described by Nickels; (3) the phenyl hydrazine method. Where the sulphur is present as bisulphide of carbon, all of these methods give good results. The first method was till lately the usual one employed; but recently the last of the three has been popular.

Messrs. Holland and Philips assert that by their method other sulphur compounds than bisulphide of carbon are changed into barium sulphate, so that by it the amount of total sulphur can be determined; and this view seems to be taken by Allen, though Lunge quotes Victor Meyer in opposition to the assertion. Methods Nos. 2 and 3 are, on the face of them, quite impracticable for the determination of the total sulphur, and can be used for bisulphide of carbon alone.

A sample was recently received by me, and, tested by No. 1 method, was found to contain 0·23 per cent. of sulphur. On determining the specific gravity, I found it to be nearly 0·883, which was too high for so pure a sample. As the only impurities which raise the specific gravity of benzol are bisulphide of carbon and thiophene, I concluded to try some other method for the estimation of the total sulphur, and to devise such a plan that an ordinary gas chemist or engineer can employ it with apparatus he already possesses, and one which shall be analogous to the standard method of testing for the grains per 100 cubic feet of coal gas in use in every gas-works.

The following, then, is the method I employ (it is really an adaptation of Allen's test for sulphur in fats): I use the ordinary apparatus for estimating sulphur in gas, which every gas-works in the country of any size possesses. I take away the burner, and replace it by a spirit-lamp capable of holding 100 c.c. of spirit. Of the benzol to be tested I carefully measure out 10 c.c. into the spirit-lamp, and then to it add 90 c.c. of pure alcohol or methylated spirit, shake the two up together, and light the lamp. Round the lamp I place several pieces of fresh carbonate of ammonia, and in other respects proceed exactly as in the test for sulphur in gas. The arrangement is shown in the accompanying figure.



Spirit-lamp. B. Trumpet tube. C. Condenser, with glass marbles. D. Draught-pipe. E. Beaker into which the condensed liquor falls. F. Fresh carbonate of ammonia.

The special precautions to be observed are as follows: (1) Care must be taken that the flame is not too large, otherwise it will smoke. As the test proceeds it usually increases in size, and should therefore, at first, be lower than it is intended to be. If any trouble should arise through smoke, a larger proportion of spirit may be used. (2) If methylated spirit be employed instead of pure alcohol, then a blind test should first be carried out with the 90 c.c. of spirit alone, and a deduction (which will be found to be very small) for the sulphur it contains must be made. (3) No more wick than is absolutely necessary should be employed in the lamp.

The calculation is simple. Supposing the amount taken were 10 c.c., and the weight of barium sulphate, less the correction for the methylated spirit, 0·521 gramme, the answer in grammes of bisulphide of carbon per litre would be—

$$\frac{0{\cdot}521 \times 32 \times 1000}{233 \times 10} = 7{\cdot}155.$$

The answer in grains per gallon would be—

$$7{\cdot}155 \times 70 = 500{\cdot}8.$$

The answer in percentage would be—

$$\frac{7{\cdot}155}{0{\cdot}880 \times 10} = 0{\cdot}81,$$

where 0·880 = the specific gravity of the benzol.

If, instead of 10 c.c., 96 fluid grains were taken, then the number of grains of barium sulphate found would indicate without calculation the grains of sulphur per 0·01 gallon of benzol; and this result would also show the number of grains of sulphur per 100 cubic feet of gas which the said benzol would cause to be added to that originally present in the gas, supposing 1 gallon per 10,000 cubic feet of gas were employed.

The following are a few examples of results:—

	Holland and Philips' Method Per Cent.	Combustion Method. Per Cent.
No. 1.—Staffordshire benzol (the sample above referred to).	0·23	(0·44 / 0·45) Duplicate tests.
No. 2.—Staffordshire benzol . .	0·25	0·57
No. 3. ,, ,, . .	—	0·88
No. 4.—Lancashire benzol . .	—	0·07
No. 5. ,, ,, . .	—	0·04
Methylated spirit	—	0·01

The above table shows first that the results of the Holland and Philips' method are too low, probably because only the sulphur in the bisulphide of carbon is acted upon, and also because a benzol practically free from sulphur can be readily obtained.

This method does not pretend to be scientifically accurate, any more than is the case with the standard test for sulphur in gas. Both probably give results lower than the reality; but as the principle is the same in each, the error will be proportional.

As there are many gas chemists and engineers unfamiliar with the conditions requisite for ensuring that the article which they purchase is, in other respects than sulphur, the most suitable for the objects they have in view, I propose now to state them in full:—

1. *Colour.*—The benzol should be water white.
2. *Specific Gravity.*—This should be ·880 to ·882.
3. *Distillation.*—When 100 c.c. are distilled in an ordinary retort, with condenser, about 90 c.c. should distil over at 100° C, and by the time the thermometer reaches 115° C., the bulb of the retort should be dry.

(*a*) *Size of Retort.*—The retort when full to overflowing should contain about 200 c.c.

(*b*) *Rate of Distillation.*—This should be as rapid as possible, so long as the distillate falls into the receiver in separate drops.

(*c*) The bulb of the thermometer should be in the liquid, and $\frac{3}{8}$ inch from the bottom of the retort.

In conclusion, I might say there ought never to be any difficulty in supplying benzol to meet the requirements mentioned.

Bisulphide of carbon can be readily extracted by practical distillation; while the mercaptans and thiophene can be easily removed by continued washing of the benzol with strong sulphuric acid. At the end of the operation, the vessels B, C, and D are all washed with distilled water into E, a little bromine water added, and the sulphuric acid estimated in the ordinary manner.

ARSENIC IN COAL AND COKE.

The subject of the presence of arsenic in coke has lately been brought before the Society of Chemical Industry. At the meeting of the Nottingham Section, at Leicester, on the 24th of April, it was dealt with in a paper prepared jointly by Messrs. L. Archbutt and P. G. Jackson; and on the 6th ult., Messrs. R. F. Wood Smith and R. L. Jenks directed the attention of the London members to it. The communication of the first-named gentlemen was briefly noticed in the "JOURNAL" for the 30th of April; the other, however, was taken as read. Both are given in the current number of the Society's "Journal," from which we reproduce them in the order named.

THE DETERMINATION OF MINUTE QUANTITIES OF ARSENIC IN COKE.

The discovery of arsenic in beer brewed from malt and hops, and the detection of arsenic in malt, has led to the source of the arsenic being traced to the fuel, either coke or anthracite coal, which is used in drying the malt. When such fuel is burnt, minute quantities of arsenic, originally derived from the iron pyrites or "brasses" present in the coal, are volatilized, and are deposited upon the surface of the malt, which in the process of being dried in the kiln is exposed to direct contact with the hot fuel gases.

The fact that lignite and coal may contain arsenic has long been known. The late Dr. Percy, in his volume on "Fuel," &c. (1876), states that Daubrée found from 0·08 per cent. (5·6 grains per pound) to 0·20 per cent. (14 grains per pound) of arsenic in ordinary specimens of lignite from the tertiary strata, at Lobsann, on the Lower Rhine; 0·003 per cent. (0·21 grain per pound) in the carboniferous coal of Saarbrück; 0·0415 per cent. (2·9 grains

per pound) in coal occurring at Villé, Bas-Rhin, in France; and traces of arsenic in coal from Newcastle-on-Tyne. Dr. Angus Smith discovered arsenic in the iron pyrites of fifteen specimens of Lancashire coal, and of a few others. Dugald Campbell found arsenic in the iron pyrites of coal; and in Dr. Percy's own laboratory decided traces of arsenic were detected in a coal from Nottinghamshire.

The idea that gas coke might contain arsenic has been ridiculed on the ground that this element, its oxides, and such of its compounds as are solid at the ordinary temperature, volatilize below 500° Fahr. It has been argued that the first effect of heating the coal would be to drive off the arsenic, and that to test gas coke for arsenic is simply a waste of time. The fallacy of such *à priori* reasoning is illustrated by some very interesting observations recorded by Dr. W. H. Willcox in a paper communicated to the "Lancet" of March 16, 1901.* Dr. Willcox found that if, in Marsh's test for arsenic, finely divided substances are introduced into the heated portions of the tube, they have a very great influence in preventing the formation of the arsenical mirror. In preparing a series of standard mirrors with solutions of arsenic of varying strengths, it was found that the mirrors were very much smaller if a mixture of carbon and dry sodium carbonate were placed in the heated part of the tube immediately over the flame, as has been recommended in order to retain sulphur. Dr. Willcox asserts that the use of this mixture prevents as much as nine-tenths of the arsenic from depositing in the mirror form, when minute quantities of arsenic are being tested for. It at once occurred to him that one of the bodies, either the carbon or the sodium carbonate, must be responsible for this; but to his astonishment he found that each is able to prevent the formation of the arsenical mirror. Thus, if the heated portion of the tube, within the clay chimney, be filled with either dried sodium carbonate or carbon, and in either case 0·5 milligramme of arsenic trioxide be introduced into the flask, almost the whole of the arsenic is retained by the strongly heated substance, and scarcely any arsenical mirror results; while with nothing in the heated portion of the tube, a very large mirror was formed by the same quantity of arsenic. It next occurred to Dr. Willcox to try the effect of some inert finely divided material, such as fine sand which had been previously ignited. This sand, placed in the heated portion of the tube (within the clay chimney), caused the retention of almost all the arsenic, and only a very minute mirror was obtained. In this experiment, 0·5 milligramme of arsenic trioxide was introduced into the flask. The sand became perceptibly darkened in colour, but no amount of heating would cause it to give up its absorbed arsenic. It seems, therefore, in view of these observations, not surprising that in the manufacture of coke some, at least, of the arsenic contained in the coal should be retained by the coke; and we know, from analyses which have been made by several chemists, that such is the case.

The fact should not be lost sight of that in burning coke a very considerable proportion of the arsenic remains in the ash. Two different cokes, containing respectively 0·14 grain and 0·16 grain of As_4O_6 per pound, were ashed in platinum dishes in a Fletcher's gas muffle furnace. In one case we found 0·07 grain per pound, and in the other case 0·06 grain per pound, or 50 per cent. and 37 per cent. respectively of the arsenic originally contained in the coke still remaining in the ash. We have not had time to pursue the subject further; but the results obtained seem sufficiently interesting from the gas manager's and maltster's point of view to be worth following up.

The accurate determination of minute quantities of arsenic in a substance such as coke is a problem which presents very considerable difficulties. Taking, for example, a coke containing 0·1 grain of arsenic trioxide per pound, 70 grammes of such coke would contain only 1 milligramme of As_4O_6; and in dissolving out this minute quantity with reagents, comparatively enormous amounts have to be used, because of the large bulk of coke operated upon. These reagents must therefore be extremely pure. If the method of estimation by means of standard mirrors in Marsh's test be adopted, a much smaller quantity of coke can be employed; and had we been fortunate enough to obtain sufficiently pure reagents for the Marsh test, we should have tried burning 1 or 2 grammes of the very finely ground coke with pure dry sodium carbonate, as in Nakamura's method for the estimation of sulphur, dissolving the contents of the crucible in water and acid, and introducing the solution into Marsh's apparatus. Coke is easily and completely burnt in this way, and there is no doubt that the whole of the arsenic would be retained by the sodium carbonate.

An alternative method which suggested itself was to burn 50 grammes of coke in a combustion tube in a current of oxygen, passing the gaseous products through an acid or alkaline reagent capable of retaining any volatilized arsenic, and subsequently separating the arsenic by distillation, and titrating with N/100 iodine. But the complete combustion of so large a quantity of coke as 50 grammes in a tube is tedious, and the whole of the arsenic would not be found in the liquid through which the products of combustion were passed, but partly also in the ash, and perhaps partly in the sublimates which are formed in the tube while the combustion is proceeding.

We therefore decided to act upon the coke by means of a solvent; and the first method tried was distillation with hydrochloric acid and ferric chloride (largely reduced to ferrous chloride by the coke). This, however, though it brought over the arsenic, also brought over sulphur, which could not be prevented, notwithstanding that a large excess of ferric chloride was used. Troublesome bumping was also experienced, owing to the large quantity of coke present, and it became necessary to separate the dissolved arsenic from the coke previous to distillation. Ferric chloride was abandoned, and nitric acid of 1·42 sp. gr. was finally decided upon as the most suitable reagent for the purpose. It can be obtained quite free from arsenic; the vapour is easily condensed and returned to the boiling liquid in a plain retort, set with the neck inclined upwards, thereby avoiding the necessity of a condenser and rubber connections; and it was thought that the arsenic in the form in which it is likely to be contained in the coke could scarcely fail to be brought into solution by prolonged digestion with the boiling acid. The following are the details of the method:—

A fair average sample of the coke, obtained from a large bulk by crushing and quartering in the usual manner, is reduced to coarse powder in an American grinding mill, and rather more than 50 grammes of this coarse powder are further ground in a mortar and passed through a sieve, having 90 meshes in 1 linear inch, then dried at 100° C. Of the dry coke 50 grammes are placed in a 16-oz. plain retort, and heated for at least two hours with 100 c.c. of pure nitric acid (1·42), the neck of the retort being inclined upwards so as to condense and return the acid which evaporates. A small flame is used, large enough to maintain gentle ebullition. Copious red fumes are evolved.

The contents of the retort are transferred to a beaker, diluted with hot distilled water to about 400 c.c., and, after settling, filtered, and the coke washed by suction on a toughened filter, which is easily done. The clear filtrate is evaporated in a porcelain basin to complete dryness on a water-bath; the residue is mixed with 25 c.c. of pure concentrated sulphuric acid, and further heated, with frequent stirring, until the ferric nitrate is decomposed, and a smooth cream containing ferric sulphate and free sulphuric acid obtained. Heating is then continued over a sand-bath until sulphuric acid fumes come off. The residue, when cold, is diluted with enough water to dissolve it on warming, and again evaporated until sulphuric acid fumes appear. This is repeated until on diluting with water no smell of nitric acid is observed—the second evaporation being usually sufficient. To make quite sure of expelling every trace of nitric acid, solution and evaporation are repeated once more.

The residue is next dissolved in 50 c.c. of water and transferred to a 16-oz. distillation flask connected to a Thorpe's revenue condenser, having an adapter attached to the end, which dips below the surface of about 20 c.c. of water contained in the receiving flask. The distillation flask is closed by a rubber bung, through which is passed a thermometer having its bulb within ¼ inch of the bottom of the flask. Then 23 grammes of purified chloride of sodium and 2 grammes of ferrous sulphate are added to the liquid in the flask, which should be quite cold, and not more than 100 c.c. in volume. Distillation commences at about 110° C., and is continued until the temperature reaches 125° C., at which point the whole of the arsenic will be found in the distillate.

We have not succeeded it titrating these minute traces of arsenic in the distillate direct, after neutralization with ammonia, the end of the reaction being too indistinct. We therefore precipitate the arsenic as sulphide, by adding to the acid distillate some pure sulphide of zinc, and agitating for a few minutes until the precipitate has coagulated. The delicacy of this reaction is remarkable—as little as 0·1 milligramme of As_4O_6 in 100 c.c. being recognizable in daylight by the yellow colour produced on adding the sulphide of zinc; and after agitating for a few minutes, even so small a precipitate coagulates and can be filtered off. After filtering and washing with sulphuretted hydrogen water, the precipitate is rinsed off the paper with a fine jet of water into a flask of about 500 c.c. capacity, and boiled with about 300 c.c. of water until dissolved. The stained part of the filter-paper is added, and boiling continued for half-an-hour longer. The liquid is then filtered, concentrated to about 40 c.c., and made quite cold. About 0·5 gramme of bicarbonate of soda having been added, and some starch solution, N/100 iodine solution is put in until a blue colour is obtained. The titration should be done quickly. The end of the reaction, when titrating these very small quantities of arsenic with iodine, is never so sharp, or the blue colour so permanent, when the arsenic has been precipitated as sulphide and boiled with water, as when pure sodium arsenite is titrated direct. The experience necessary for judging the end-point sharply must, therefore, be obtained by boiling and titrating arsenic trisulphide, precipitated from known quantities of a standard solution of sodium arsenite containing 0·0005 gramme of As_4O_6 in 1 c.c. This solution is used to standardize the N/100 iodine solution.

A blank experiment must, of course, be made up with the same quantities of reagents, and in the same vessels as were used in the analysis, and any arsenic found must be deducted. In the reagents we used, the correction amounted to only 0·2 milligramme of As_4O_6. An impurity which caused some trouble at first was traces of iodic acid in the nitric acid. This was not detected until commencing to distil the blank quantity, when it was observed that the first portions of the distillate were coloured slightly yellow, and that this colour disappeared as the distillation proceeded; the traces of iodine, to which the yellow colour was

* "The Toxicological Detection of Arsenic, and the Influence of Selenium on its Tests."

due, being reduced by the arsenious chloride which subsequently came over. The result was that the arsenic became oxidized, and was not precipitated on adding sulphide of zinc in the cold. Nothing of the kind was observed in distilling the extracts from the cokes, doubtless because the iodic acid had been reduced by the nitrous acid formed on heating the coke with the nitric acid, and had been volatilized. The iodic acid was got rid of from the blank quantity by adding to the residue, left on evaporating 100 c.c. of nitric acid to dryness, a little sulphuric acid, and then a few drops of very dilute sulphurous acid solution, and heating strongly.

Test experiments were made by taking measured quantities of standard arsenic solution, distilling with sulphuric acid, salt, and ferrous sulphate, precipitating the arsenic by adding sulphide of zinc to the filtrate, boiling the precipitate with water, and titrating exactly as described above. The results obtained were as follows:—

	Gramme.		Gramme.
As_4O_6 taken	0·00503	..	0·00754
As_4O_6 found	0·00496	..	0·00739
Error	−0·00007	..	−0·00015

A few determinations were made by weighing the precipitated As_2S_3 instead of titrating. The results, when working the two methods on the same sample of coke, agreed very well, as the following figures, giving the grains of As_2S_3 found per pound of coke, show:—

	Titrated.			Weighed.
No. 1	0·27	—	..	0·25
No. 2	0·28	—	..	0·26
No. 3	0·07	—	..	0·07
No. 4	0·13	0·14	..	—

ARSENIC IN COAL AND COKE.

Since the presence of arsenic in beers brewed only from malt and hops, and also in the malt itself, has been proved beyond a doubt, the question of how far the fuels used in malting are capable of introducing this impurity has assumed importance. A conceivable method of determining the total arsenic present in the fuel is to deflagrate a sample in the manner employed for the estimation of sulphur, and to submit the residue, after it has been suitably reduced, to quantitative examination by the Marsh-Berzelius-Hehner method. Experiment makes it clear, however, that such a method gives results that are of little use to the maltster, whose only concern is as to the amount of arsenic that will find its way into the malt during the drying processes. This amount undoubtedly differs from the total arsenic present in the raw fuel, one part of this being "volatile" and very dangerous, while the other remains "fixed" in the fuel ashes, and is therefore far less so.

For these reasons, it appears desirable to lay before this Society a method of analysis which imitates as closely as possible the conditions that obtain in the malt-kiln itself, and which makes it possible, without the use of any chemical reagent other than dilute sulphuric acid known to be arsenic free—a point itself of particular importance—to state with considerable confidence whether or not a given coal or coke may be safely employed as a malting fuel.

Briefly, the method is as follows: A piece of hard combustion tubing about 20 inches long is selected, one end of which is left open; about 4 inches from the other end the tube is drawn before the blowpipe flame into a constriction about 2 mm. in diameter. The next inch is left to form a bulb or reservoir, and the last 3 inches are drawn into a long tapered nose-piece of convenient bore (say, 2 to 3 mm.), and bent at right angles so that it can be passed through the rubber stopper of a wash-bottle of any desirable shape or size. This wash-bottle is partly filled with dilute sulphuric acid arsenic free, and air can then be aspirated through the whole apparatus by means of a short elbow-piece passing out from the stopper, and connected to the suction-pump. If more convenient, air may be forced through the tube by positive pressure at the other end; but in either case volatile products are to be condensed in the bulb or the acid contained in the wash-bottle. The use of oxygen or any special oxidizer to assist combustion does not appear desirable, as being too great a departure from normal conditions.

From 5 to 15 grammes of the sampled fuel are broken into fragments of about the size of a pea, placed in the combustion tube near the free end, and heated on an ordinary combustion furnace, when the pump has been started and is working smoothly. The current of air should be fairly rapid in order to ensure as complete combustion as possible. The layer of fuel should be from 6 to 8 inches in length, loosely but continuously packed, and consisting of the small fragments described above. The conditions of a kiln fire are thus fairly closely reproduced, and experiments show that the rigid sampling and minute pulverizing usually observed in mineral analyses are unnecessary, and disadvantageous for the purpose in question.

The whole tube is now cautiously heated to remove moisture, and the fuel then strongly ignited inch by inch—proceeding from the end at which the air enters the tube. If the farther end is judiciously heated, all condensation takes place in the bulb beyond the constriction, or in the acid of the wash-bottle. Care must be taken that the arsenical vapours are not allowed to pass over any length of calcined material, in which case the results obtained are significantly lower than when this treatment is avoided. As, however, the fuel glows brightly in the region of combustion, it is not difficult to adjust the speed of ignition so as to obtain the required condition. The heating usually lasts for some three hours, the ash being then left for the most part as a nearly colourless or ruddy powder. It is probable that all the volatile arsenic is obtained in a much shorter time; but the ash is difficult to treat unless thoroughly burnt. The operation requires little attention if the pump can be relied upon to work automatically.

When the tube is cold, the ashes are carefully withdrawn and laid aside for determination of "fixed" arsenic, while the contents of the bulb are washed into the bottle with dilute acid by means of a pipette long enough to reach down to the constriction. In this way only deposits beyond the constriction are removed, any dust on the walls of the main part of the tube being left to be washed into the ashes. A simpler method is to sever the tube at the constriction, proceeding at once to examine the volatilized products, and leaving the rest of the tube to cool in the furnace. The contents of the wash-bottle are made to a definite bulk, and an aliquot part added to the Marsh apparatus; the results calculated on the amount of fuel used being returned as "volatile arsenic."

The ashes are then triturated in a clean mortar, washed with dilute sulphuric acid into a small flask, gently warmed for a few minutes, and then allowed to stand for at least 12 hours. In this way any arsenic compounds present are reduced practically completely to the arsenious condition by the hydrogen sulphide, which is always observed to be evolved in appreciable quantity. The liquid is then diluted to a suitable bulk, and an aliquot part, previously warmed on the water-bath to remove excess of hydrogen sulphate, passed into the Marsh apparatus.

This result is returned as "fixed arsenic." Three fuels used for malting purposes gave the following results, in grains per pound of fuel, when examined as described above:—

	Volatile Arsenic.		Fixed Arsenic.
(*a*) Anthracite	$\frac{2}{10}$	..	$\frac{1}{2}$
(*b*) Coke breeze	$\frac{1}{10}$	..	$\frac{1}{2}$
(*c*) Gas coke	$\frac{1}{12}$	..	$\frac{1}{2}$

The ashes removed from the kilns themselves, eight in number, after a mixture of anthracite (two parts) and coke (one part) had been burnt for some days, gave the following amounts of arsenic per pound of ashes: No. 1, $\frac{1}{8}$ grain; No. 2, $\frac{1}{2}$ grain; No. 3, $\frac{1}{3}$ grain; No. 4, $\frac{1}{5}$ grain; No. 5, $\frac{1}{4}$ grain; No. 6. $\frac{1}{9}$ grain; No. 7, $\frac{1}{7}$ grain; No. 8, $\frac{1}{4}$ grain. It will be seen that the actual kiln ashes contain amounts of arsenic that are in close agreement with amounts that might have been predicted from the quantities of "fixed arsenic" found in the original fuels. The amounts of arsenic found in the malts dried with the same fuels also averagely correspond with those indicated by the volatile arsenic figures.

Another point in proof of the fact that the malts derive their arsenic almost solely in the volatile form is that the organic dusts which settle on the beams of the drying-kiln, immediately over the malt, contain, on an average, 2 grains of arsenic per pound of dust—a proportion which could never have been obtained by the mechanical admixture of ash dust, which only contained $\frac{1}{2}$ grain of arsenic per pound.

It seems evident that a useful distinction can be drawn between the volatile and fixed arsenic present in malting fuels when determined in the manner described, and that comparatively little value can be attached to an estimation of the total arsenic only.

It might be added, in conclusion, that these results seem to confirm the possibility of retaining all the arsenic in fuels in the "fixed" form, as had, in fact, been suggested some time back by Mr. Newlands, who has applied for patents in this connection.

THE FISCHER GAS LIGHT.

We have received from a Vienna correspondent a glowing description of the Fischer light, which is an incandescent light produced by the combustion of an air gas obtained according to a process invented by Herr Gustav Fischer. In the absence of full details of this process, many readers of the "JOURNAL" will doubtless receive the statements of our correspondent with a considerable amount of scepticism; but pending the receipt of further particulars, we give the following digest of his report, which contains an assurance that the apparatus must not be confounded with the "well-known highly dangerous gasoline" type of air-gas plant.

The apparatus comprises an ordinary hot-air engine connected with a blower, which forces air into an air-chamber, whence it passes into a carburettor. The carburettor is supplied from reservoirs with the carburetting liquid, which may be refined or crude coal-tar or wood-tar oil, or petroleum, but preferably is benzol. The peculiar construction of the carburettor is stated to effect a very intimate carburetting of the air, which is then conveyed by ordinary service-pipes to the burners. There is a special device for regulating the flow of the carburetting liquid to the carburettor from the reservoirs, which may be at a distance from it, and for maintaining automatically a uniform quantity of the liquid in it. The air gas is produced without the application of steam or heat; and water is not required either for cooling the hot-air motor or for any other purpose. Hence freezing and condensation in the apparatus or pipes is said to be avoided. The hot-air motor is cooled automatically by the current of air which it produces. An apparatus adapted for the supply of 100 burners is only of about the size of a sewing-machine, including both motor

and blower. The consumption of carburetting liquid is so small that only a relatively small stock is required, such as may be kept without a special permit. Two or three turns by hand suffice to start the apparatus, which then continues in operation automatically. It is said to be unnecessary to dismantle the plant for cleaning purposes until after it has been in use some years. The whole of the carburetting liquid is evaporated, without any residue being left in the apparatus.

The advantages of the Fischer plant are summed up as follows: There is no danger, either by explosion or otherwise. It has been demonstrated that the apparatus may be worked with safety near an open fire, and that the gas present in the carburettor during generation may be ignited at any time. The carburettor contains only as much gas as is to be consumed at once, and not a store of old gas. The production is regulated automatically according to the consumption; so that even if but one burner is lighted, only the gas required for it is produced. If the apparatus is started, and no burners are lighted, only the gas needed for working the hot-air motor is produced. When the apparatus is stopped, the whole of the gas burns off, so that there can be no danger from open gas-taps. There is no after-development. Neither the benzol nor the gas obtained from it is said to be affected by winter temperatures. A certificate of the Imperial Technological and Industrial Museum at Vienna testifies that the Fischer gas gives an illuminating power of 206 candles in an ordinary incandescent burner, as compared with 60 to 70 candles with ordinary coal gas. With air under pressure, a light of 900-candle power is obtainable. The colour of the Fischer light is white, but is not disagreeable to the eyes. The certificate states that the consumption of benzol is equal to 0·075 lb. per hour for a light of 140-candle power. At the current prices of benzol and coal gas in Vienna, this cost is, light for light, about one-eighth that of incandescent lighting by coal gas. The apparatus can be produced at a low cost, and needs very little attention (which may be given by an unskilled hand) in starting, &c. It may be made for installations of any capacity. The Fischer gas is well adapted for use for heating and power purposes. It has more than double the calorific power of coal gas. The plant is, however, specially intended for use in places which have no supply of coal gas.

REGISTER OF PATENTS.

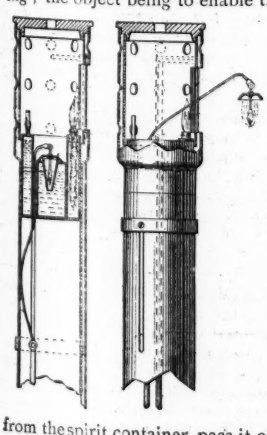
Carburetting and Increasing the Pressure of Combustible or Incombustible Aeriform Fluids for the Purposes of Heat, Light, or Power.—Bower, A. S., of St. Neots. No. 10,514; June 8, 1900.

This invention relates to methods of carburetting any aeriform fluid which may or may not be inflammable—that is to say, it may be atmospheric air or the like, or an inflammable gas. The inventor describes means whereby such carburetted inflammable fluid is delivered from the apparatus at a considerable pressure—such pressure, or that part of it which is in excess of what the uncarburetted fluid originally possessed—being created by the working of the apparatus itself.

One of the main objects of the invention is to enable isolated houses to be easily lighted by incandescence; for the carburetting liquid, says the patentee, need not be of anything like such a volatile and costly nature as the gasoline commonly used. Benzol or similar hydrocarbon will, he points out, sufficiently carburet common air so as to be non-explosive and perfectly stable in transit; and since the pressure is automatically raised, it may be considerable. Furthermore, the fluid carries with it a larger quantity of the air required for completing combustion; and it has therefore little to do, when it arrives at the burner, in the way of dragging along and propelling more air, as is the case with ordinary illuminating gas. The result will thus be exactly the same as that which is sought to be obtained with ordinary town gas, by compressing such gas to a high pressure by the use of water power, electricity, hot air in engines, and the like.

Gas Lighting Torches.—Glover, J. G., of Clerkenwell, E.C. No. 11,766; June 28, 1900.

This invention relates to gas-torches such as are used for street lighting; the object being to enable the torches to be employed for lighting incandescent lamps as well as ordinary gas-lamps, without it being necessary to place the torch at an angle for the uprising gas to meet the flame within the torch—thereby avoiding all danger of breakage to the lamp, chimney, or mantle.



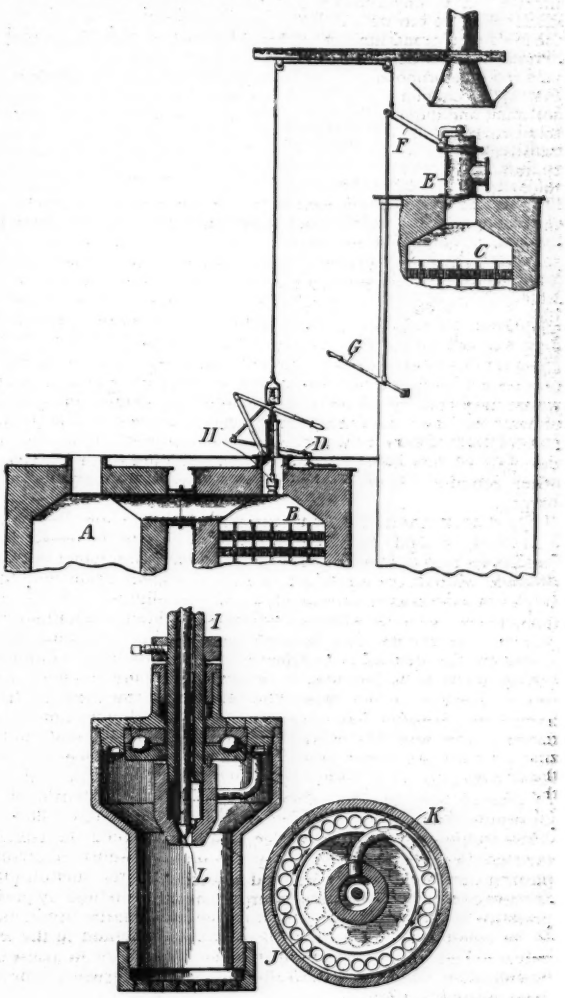
The arrangement is sufficiently indicated by the engraving. The claims for novelty are for the use, in a gas-lighting torch, of a sponge or other spirit holder removable from a spirit container and lighted by a fixed flame on its passage from the spirit container to a projected position outside the torch. The combination claimed is an oil container and a spirit container; a sponge or other absorbent connected to a spring of desired "set;" and a ring or other handle for operating the spring or sponge-holder, so as to remove the sponge-holder from the spirit container, pass it over a fixed flame of the oil-container so as to ignite the saturated sponge, and then project it outside the torch.

Textile Fabrics for Incandescent Mantles.—Hill, H., of Nottingham. No. 13,259; July 23, 1900.

In order to furnish increased strength and luminosity to incandescent mantles when impregnated and burnt-off in the usual way, the patentee proposes to employ a textile fabric, made of threads or fibres of two or more different materials—such, for instance, as cotton and rhea. This can be effected either by using a yarn spun from these different fibres combed together, or the fabric may be manufactured of threads of two or more materials so interwoven as to produce a homogeneous fabric.

Injecting Oil in the Manufacture of Carburetted Water Gas.—Johnston, J. P., of Oak Park, Ill., U.S.A. No. 14,426; Aug. 11, 1900.

In the ordinary construction of water-gas plant, the patentee points out, it is usual to supply the oil to the carburettor through feeding or spraying devices arranged in the carburetting chamber, and consequently subjected to the heat thereof; the result being that the oil-feeder is soon burnt out and has to be replaced. This objection is avoided by him by providing for automatically withdrawing the oil-feeder from the carburetting chamber when not in use—as illustrated in the engraving, which shows the upper part of a generator, a carburettor, and a superheater, with the oil-feeding devices and the apparatus for automatically moving them into, and out of, the carburetting chamber.



A is the generator; B the carburettor; and C the superheater. A passage D extends upwards from the top of the carburetting chamber. E is a stack which rises from the top of the superheater and communicates with the superheating chamber. A cap or valve is adapted to close this stack. The valve is pivoted on a spindle carried by a crank arm carried by a horizontal shaft pivoted at the top of the stack; the arrangement being such that, by rocking the shaft, the valve can be raised or lowered so as to open or close the stack. There is a lever F connected to the shaft for operating it. G is a hand-lever connected by a rod with the lever F, so that the operator can move the lever F and raise or lower the stack-valve. H is the oil-feeding device supported in the passage D; so that when the lever F is in its uppermost position, the valve will lie over and close the stack, and at the same time the oil-feeder will be in its lowermost (operative) position. When the operator moves the lever down to raise the valve and open the stack, the same operation will raise the oil-feeder, drawing it out of the carburetting chamber, and removing it largely from the heat thereof.

The operation of the feeding and spraying apparatus (which is shown separately) is as follows: The feeding device being in the proper position, liquid is introduced to the tube I, down which it flows under a pressure of from 15 to 80 lbs. to the square inch, when oil is to be sprayed. A small part of the liquid (usually about one-third of the quantity to be supplied) passes down through the nozzle J; the needle-valve being properly adjusted to that end by operating its hand-wheel.

The remainder flows through the pipe K, and is discharged with considerable force, depending on the pressure, into the series of cups shown, causing the head to rotate in the direction indicated by the arrow. This rotation of the head spreads the liquid over the interior surface of the cylinder (which rotates with the head), and serves to scatter the liquid and cause it to hug the interior surface. The liquid gradually passes down and out through the holes at the foot of the nozzle, and is sprayed by the rotation of the nozzle.

If when the apparatus is in operation it should be found that the proper quantity of liquid is not being supplied, the amount may be varied without changing the pressure by adjusting the needle-valve L. In practice, however, the patentee finds that the valve provides a sufficient degree of variation for all needful purposes; so that it is hardly ever necessary to vary the pressure of the liquid in order to properly regulate the quantity of liquid supplied. To adapt the apparatus for purposes requiring a very much greater or less quantity of liquid, it is necessary simply to vary the size of the pipe K through which the liquid is discharged against the cups; but under ordinary circumstances, all necessary variation may be secured by adjusting the needle-valve.

Manufacturing Incandescent Bodies.—Kohl, G., of Budapest, Hungary, No. 827; Jan. 12, 1901.

This invention relates to a method of manufacturing "firm and durable" incandescent bodies without cerium, which "combine a high illuminating power with a great resistibility against pressure, fresh draughts of air, and the like, and which excel in these respects those incandescent bodies in which cerium forms a component."

In the usual method of manufacturing incandescent bodies (says the patentee), the fabrics produced from vegetable fibres are impregnated first with a solution of the salts of zinc, tin, bismuth, and calcium—the solution containing also a certain quantity of borax—and then with a solution of the nitrates of thorium, cerium, barium, strontium, indium, gallium, and samarium; and afterwards the impregnated bodies are subjected to the action of a flame. In contradistinction to this method, the patentee proposes to make use of only one solution, which, instead of cerium, contains a mixture of the nitrates of uranium, zirconium, lanthanum, and didymium—preferably also of platinum.

In carrying his invention into practice, he first prepares separate solutions of these nitrates, the proportions being about as follows: 3 grammes of nitrate of uranium dissolved in 250 grammes of distilled water; 10 grammes of nitrate of zirconium dissolved in 50 grammes of distilled water; 10 grammes of nitrate of lanthanum dissolved in 50 grammes of distilled water; and 1 gramme of nitrate of didymium dissolved in 100 grammes of distilled water. He prefers, however, to prepare some other solutions: About 2 grammes of nitrate of zinc, 1·2 grammes of nitrate of tin, 1 gramme of nitrate of bismuth, 1 gramme of borax, and 1 gramme of nitrate of calcium—each dissolved in about 500 grammes of distilled water.

The rare earths mentioned in the first series are those upon which depends part of the illuminating power of the incandescent bodies; whereas the chemical bodies mentioned in the second series are those upon which mainly depends the firmness, elasticity, and durability of the incandescent bodies. Concerning the borax, it is advantageous to use warm or hot water for dissolving it.

Another solution is then prepared of the following substances: 1400 grammes of nitrate of thorium, 200 grammes of nitrate of ammonium, 0·14 gramme of nitrate of barium, 10·57 grammes of nitrate of strontium, 0·42 gramme of nitrate of indium, 0·14 gramme of nitrate of gallium, 0·84 gramme of nitrate of samarium, and 0·001 gramme of double cyanide of platinum-barium. These substances are dissolved in about 2800 grammes of distilled water, and to the solution is added: About 25 grammes of the uranium solution, 5 grammes of the lanthanum solution, 10 grammes of the zirconium solution, 5 grammes of the didymium solution; and preferably also about 2 grammes of the zinc solution, or about 1·2 grammes of the tin solution, 1 gramme of the bismuth solution, 1 gramme of the borax solution, or 2 grammes of the calcium solution, or two or more of these separate solutions, or even all of them, according to the desired degree of elasticity and resistibility of the incandescent bodies.

The mixture thus attained is the impregnating fluid or liquor proper, and the raw incandescent bodies are then dipped into, and impregnated with, the fluid or liquor, and afterwards dried (preferably at a slowly rising temperature), and incinerated in the usual manner.

The nitrates of the barium, strontium, indium, gallium, and samarium form together a preparation which is known in commerce under the term "Russium."

APPLICATIONS FOR LETTERS PATENT.

603A.—KENT, W. G., and GORDON, J., "Motors, meters, pumps, and the like." June 6.

11,344.—POMILIO, C., "Fluid pressure valves." June 3.

11,352.—MILBOURNE, R. J., "Fastening and releasing the covers of gas-purifiers." June 3.

11,355-6.—MILBOURNE, R. J., "Gas-purifiers." June 3.

11,478.—BISSEKER, H., "Suspending globes or shades for lighting." June 5.

11,492.—SHARP, J., "Prepayment gas-meters." June 5.

11,504.—LEROUX, J. B., and CARMIEN, P. J., "Heating and incandescent lighting." June 5.

11,532.—FERGUSON, F., and BLAU, E., "Carburetted air." June 5.

11,647.—HAMER, J., "Mantle-holder." June 7.

11,682.—MASTERS, A. A., "Improvements relating to lighting and heating." June 7.

11,714.—KINSEY, H., CHALLENGER, G., and NOTT, J. H., "Generating and storing acetylene gas." June 7.

11,757.—ADAMS, F. C., "Utilizing the explosive power of gases." June 8.

11,785.—LUX, H., "Incandescent gas-burners." June 8.

11,787.—SMITH, T. B., "Incandescent gas-lamps." June 8.

11,790.—PYE, T. E., "Generating acetylene gas." June 8.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

A Chemist's Warning as to a Supposed New Danger in Gas-Works.

SIR,—As you have already devoted two of your valuable columns to a paper which you hold to have been unnecessary and presumptuous, I can hardly expect you to publish a lengthy reply; but reply of some sort there must be.

I addressed the Society of Chemical Industry advisedly. It numbers many gas engineers among its members, and the mass is made up of unprejudiced individuals, well qualified to appreciate the point I wished to make, and, with your assistance, apparently have made. The "JOURNAL OF GAS LIGHTING" says that gas engineers have nothing to learn from me with respect to ventilation. It follows that the arrangements I criticized were carried out with full knowledge of their danger. This is a serious statement, which I did not dare to make—fixing the blame for the accident, as it does, on the shoulders of the persons responsible for those arrangements. Gas engineers may disown as a retort-house the building I described; but it nevertheless held retorts and a generator, and if people will once knowingly put dangerous apparatus in an unsuitable place, what, save publicity, will prevent their repeating the performance? I wished to make such arrangements as I described impossible in future; and I think I have succeeded.

I knew my audience well, and the necessity, in the case of some at least, for an elementary explanation of what was meant by gaseous firing. My description was doubtless inaccurate in the sense of being incomplete; but it was sufficiently accurate to enable the less-instructed of my audience to follow my paper, and I hoped brief enough to avoid boring the rest.

In conclusion, I may say that I made no reference to "columns" of any kind, and can only interpret your introduction of the word, with its following parenthesis, as an unworthy attempt to discredit an outsider, who has dared to say anything distasteful to the less reputable members of the gas profession.

Basingstoke, June 15, 1901. G. CECIL JONES.

SIR,—The article published on the above subject in the last number of the "JOURNAL" must be admitted to be a scathing criticism on the paper read by Mr. G. Cecil Jones before the Society of Chemical Industry. While agreeing with the general tenor of the remarks (made, I think, in the interest of the profession of chemistry), some protest should be recorded against the final statement, although the letter of the words may have been unguarded, and therefore not worthy of serious criticism—viz., "The gas industry have . . . much to thank chemists for; and there is much they have done for which no thanks are due." This is, to say the least, an ambiguous phrase. An engineer may help a chemist in his profession, or, conversely, a chemist may help an engineer. Each has his own province in his own profession, and each should seek assistance from the other without claiming to abrogate the knowledge of both.

I have not the least acquaintance, either privately or professionally, with Mr. G. Cecil Jones; but, whatever he has done to deserve the criticism contained in the article referred to, I do not think the remarks should be couched in such language as to apply to the chemical profession generally, instead of to an individual member of it, who is not possibly either its exponent or its representative.

June 14, 1901. H. LEICESTER GREVILLE.

[We have read and re-read the words of which Mr. H. Leicester Greville complains, and fail to see that there is any ambiguity in them to anyone professionally engaged in the gas industry. Mr. Leicester Greville, it is needless to tell "JOURNAL" readers, is so engaged; and we must really decline to believe that he does not perceive in the words in question what was present in the mind of the writer at the time. The writer's thoughts were resting on matters which are not exactly ancient history; and we know that our correspondent does not allow his knowledge of what is passing in the gas industry to be behind the day. It is therefore quite unnecessary to particularize the matters referred to. Let it be said, however—and again this can be hardly necessary—that there was no intention to in any way traduce the chemical profession generally; our admission that "there is much to thank them for" proves to the contrary. Now as to Mr. G. Cecil Jones's communication, a few plain words will suffice. In opening his communication to the Society of Chemical Industry, Mr. Jones stated that he wanted "gas engineers" to read his paper. If Mr. Jones will recognize that a person who is *qualified to bear the title* of "gas engineer" would not think of putting up such a place as he describes as a retort-house, he will perhaps understand our position a little better. As to the use of the word "columns," Mr. Jones did not confine himself to his paper; and the word appears very clearly in the notes taken at the meeting. Mr. Jones admits in his letter that he is an "outsider;" and therefore we may confidently repeat that we are afraid he does not know the gas-works and the gas engineers of this country as we know them.—ED. J.G.L.]

The Explosion and Fire at the Cork Gas-Works.

SIR,—My experience with gasholders damaged through the great explosion of chlorate of potash at St. Helens in 1899, as well as other cases I have had of telescopic holders becoming unsealed from various causes, has led me to take a great interest in the explosion and fire at the Cork Gas-Works; and I hope that, in the interests of truth for its

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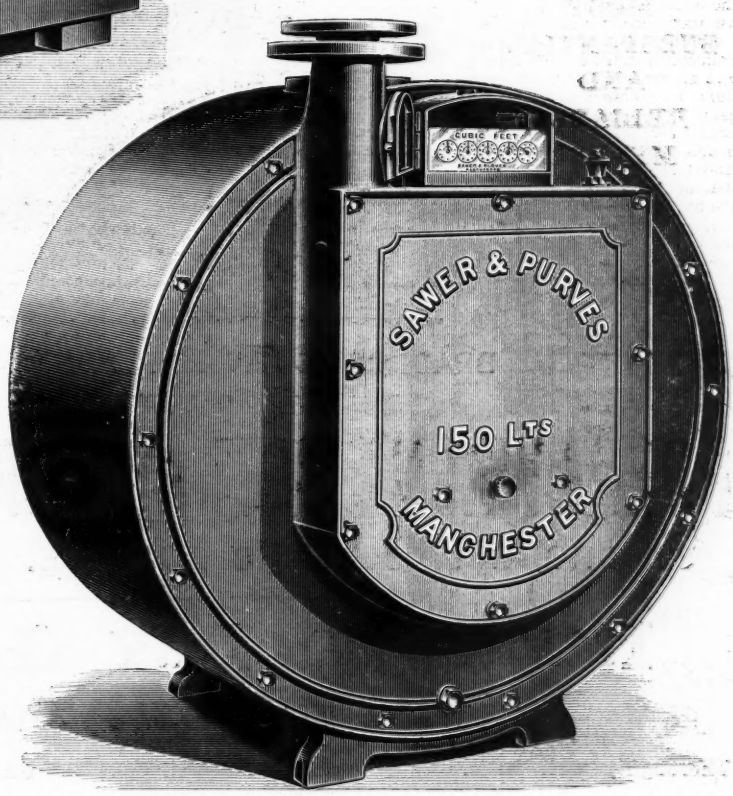

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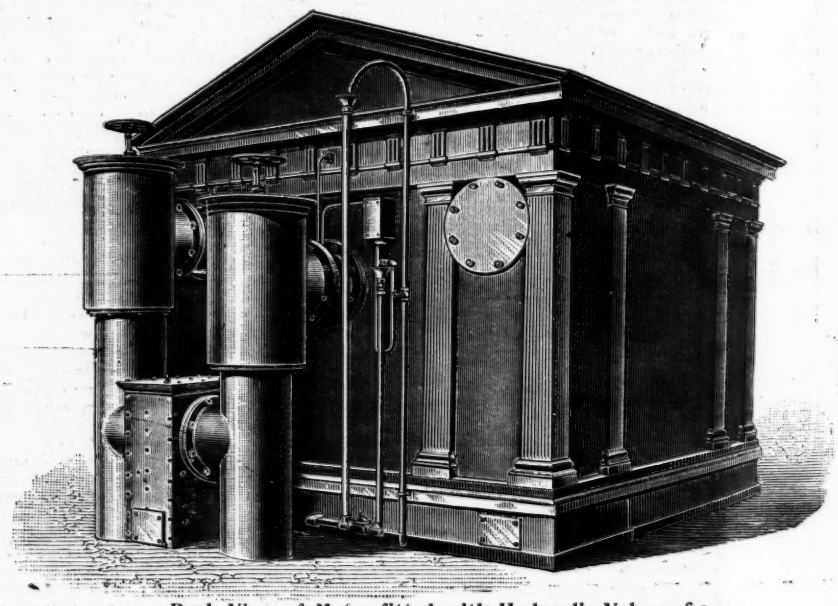

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own sake, and also that the possibly innocent strikers may not get blamed for what they may not have done, you will be able to get a much clearer report than any yet published of what has really happened.

I find it impossible to accept some of the conclusions already jumped to; and I should like to ask if you know of any evidence of the malicious use of explosives by the strikers at the Cork Gas-Works, and as to what sort of a hole was made in the holder, through which the gas is reported to have escaped and burnt for some two or three hours during which long time the holder was quietly settling into its tank. It would be of great interest as well if your readers could be informed in which way the guide-framing was held in position by the descending inner lift, and whether it ultimately fell on to the holder top or away from it. A plan of the works, showing the relative position of the gasholder yard and the retort-house and other buildings on the works in which lights were likely to have been burning at the time of day when the accident happened would be very helpful in solving the mystery in which the whole affair is so deeply involved, as would also the following particulars: The direction of the wind, if any; the temperature of the atmosphere; the total capacity of the holder, and its height within the guide-framing immediately prior to the occurrence; any clear evidence of the condition of the holder and its guide-framing; and whether it was at all out of plumb. I think the evidence of P.C. Carmody should not be disregarded.

I am sorry I have been unable this week to pay a visit to Cork for the purpose of obtaining definite information on these points, as a correct solution of the cause of the damage is very desirable, and cannot fail to be both interesting and instructive to all gas engineers; and I am sure many other of your readers besides myself would be greatly obliged if you could supply any of the necessary information.

St. Helens, June 14, 1901. SAMUEL GLOVER.

SIR,—In the last issue of the "JOURNAL," in your "Editorial Notes," you make reference to the gasholder explosion that took place in Cork some few days ago, and go on to say that the local head of the Gas Workers' Union had expressed himself as being sorry that the accident had happened. I therefore beg to inform you that not a single man of the Cork gas workers belongs to the Gas Workers' Union. I shall be much obliged if you will be good enough to publish this disclaimer in your next issue, as several of our members in different parts of the country have written to the Executive Council respecting the paragraph in question.

214, Pentonville Road,
King's Cross, N., June 13, 1901. WILL THORNE, General Secretary.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Aldeburgh Corporation (Water) Bill, Ardrossan Gas and Water Order Confirmation Bill, Bradford Corporation Bill, Bury Corporation Bill, Cromer Water Bill, Dorking Gas Bill, Golborne Gas Bill, Kingston-upon-Hull Corporation Bill, Mond Gas Bill.

Bill read a second time: Water Orders Confirmation (No. 2) Bill.

Bills read a second time and committed: Aldershot Gas and Water Bill, Bingley Urban District Council Bill, British Gaslight Company Bill, Burgess Hill Water Bill, Burton-upon-Trent Corporation Bill, Ilkeston and Heanor Water Board Bill, Kettering Urban District Water Bill, Llandrindod Wells Water Bill, Metropolitan Water Companies (Amendment of Acts) Bill, Richmond Gas Bill, Stroud Gas Bill, Swanage Gas and Water Bill, West Surrey Water Bill.

Bills reported, with amendments: Leatherhead Gas Bill, Leeds Corporation Water Bill, Newport (Isle of Wight) Gas Bill, Smethwick Corporation Bill.

Bills read the third time and passed: Barrow-in-Furness Corporation Bill, Colwyn Bay and Colwyn Urban District Gas Bill, Elland Gas Bill, Gas and Water Orders Confirmation Bill, Gas Orders Confirmation Bill, Harpenden District Gas Bill, Heywood and Middleton Water Board Bill, South Metropolitan Gas Bill, Wisbech Water Bill.

The Burgess Hill Water Bill, the Tees Valley Water Board Bill, and the Water Orders Confirmation (No. 1) Bill [South Staffordshire Order opposed] have been referred to a Select Committee, consisting of Lord Harris (Chairman), the Earl of Ilchester, the Earl of Yarborough, Lord Erskine, and Lord Ludlow; to meet on Wednesday, June 19.

The Aldershot Urban District Council have petitioned against the Aldershot Gas and Water Bill; the South Metropolitan Gas Company, the Kent Water Company, and the London County Council, against the Bexley Tramways Bill; the Bradford Corporation, against the Bingley Urban District Council Bill; the Staines Reservoirs Joint Committee, against the Metropolitan Water Companies (Amendment of Acts) Bill; the Leigh Corporation, against the Golborne Gas Bill; and the South Metropolitan and Wandsworth and Putney Gas Companies, against the London County Council (Tramways and Street Widenings) Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read the first time and referred to the Examiners: Elland Gas Bill, Gas and Water Orders Confirmation Bill, Harpenden District Gas Bill, Heywood and Middleton Water Board Bill, Wisbech Water Bill.

Lords Bills read a second time and committed: Broadstairs and St. Peter's Water and Improvement Bill, Faversham Water Bill, Handsworth Urban District Council Bill, Leeds Corporation (General Powers) Bill, Poulton-le-Fylde Gas Bill, Prestatyn Water Bill, South Essex Water Bill, Southport Water (Transfer) Bill.

Bills reported, with amendments: Newcastle-upon-Tyne and Gateshead Gas Bill [Lords], New Swindon Gas Bill [Lords], Rhyl Improvement Bill, Shrewsbury Gas Bill [Lords], Sutton-in-Ashfield Urban District (Water) Bill [Lords], Winsford Urban District (Gas Transfer) Bill.

Bill reported without amendment: Otley Gas Bill [Lords].

Bills read the third time and passed: Aldeburgh Corporation (Water) Bill, Bradford Corporation Bill, Bury Corporation Bill, Cromer Water Bill, Golborne Gas Bill, Oakham Water Bill [Lords], South Metropolitan Gas Bill.

The Ardrossan Gas and Water and the Hamilton Burgh Provisional Orders Confirmation Bills, under the Private Legislation Procedure (Scotland) Act, 1899, have passed all their stages.

The Handsworth Urban District Council Bill, the South Essex Water Bill, and the Southport Water (Transfer) Bill have been referred to a Select Committee, consisting of Sir James Kitson (Chairman), Mr. Bull, Mr. Burke, and Mr. Hain; to meet on Thursday, June 20.

HOUSE OF COMMONS.

Tuesday, June 11.

SOUTH METROPOLITAN GAS BILL.

On the order for the third reading of this Bill,

Mr. LOUGH moved, as an amendment, that it should be recommitted. He explained that the promoters sought to raise additional capital, and the Committee to whom the Bill had been referred had thought fit to vary, in favour of the Company, the Standing Orders with regard to the conditions under which the capital should be raised. According to these Orders, where a gas or a water company sought to raise additional capital, the stock had to be offered by public auction or tender; whereas the Bill provided that it should be allotted to customers and employees of the Company. He contended that the reasons the Committee had given for varying the Standing Orders in favour of the Company were inadequate, and not such as should induce the House to sanction the action proposed. The large bulk of the capital of the Company held by the public would be depreciated by the allotment of the additional capital at a lower price to a favoured few, and instead of there being free competition there would be a "ring" in the stock.

Mr. J. O'CONNOR seconded the amendment.

Mr. BANBURY said the arguments of the honourable member for Islington were quite illusory. The object of the provision in the Standing Orders was that the stock of such a Company as the one whose Bill was before the House should be sold at the highest price obtainable. None of the new issues of capital had been made by auction, but always by tender; and the only object in varying the Standing Orders was to give an alternative to the Company that they might get a better price for their stock by offering it at a fixed rate to their consumers and employees. An absolute margin was difficult to fix; but the issue at not less than 5 per cent. below the market price would be subject to the consent of the Board of Trade; and the variations in the Bank rate and other conditions would be taken into account. To provide that the offer should be made after the invitation of tenders, would directly have the effect of depreciating the value, and would be the worst possible manner of issuing any stock. The technical reasons in favour of the proposal had been well considered by the Committee; and he hoped the House would support their decision.

Mr. TAYLOR appealed to the House to support the Committee and assist the Company in extending the system by which their employees had become shareholders to the extent of £100,000. The sound business principles upon which the affairs of the Company had been conducted, and the price at which gas was supplied to the consumers, justified the Committee in making the exception in their favour.

Sir H. FLETCHER, as Chairman of the Committee, said they were well aware they were adopting an exceptional course in passing the clause; but, taking everything into consideration, they felt they were really carrying out the object with which the Standing Order was framed.

Mr. BUXTON saw no objection to the issue of capital at a fixed price if the public were allowed to participate; but, under the proposal in the Bill, he feared that one of the objects contemplated by those who proposed the Order would disappear.

Mr. J. W. LOWTHER pointed out that the Standing Order had not been evaded, because it gave a Committee just that alternative which had been taken advantage of in this case. The Committee came to their decision upon full evidence, and he had no doubt they arrived at a proper conclusion. The Company were prepared to amend the phraseology of the clause so that all consumers should have the opportunity of taking up stock, and there would be no restriction to a favoured few.

Mr. STRACHEY (a member of the Committee) said the Committee were not unanimous in their decision, and were greatly influenced by the evidence given by Mr. Livesey, the Chairman of the Company, who put forward the idea of a great company composed entirely of shareholders who were consumers. There were, however, many occasions upon which the abrogation of the auction clauses had been proposed in Bills of this kind, and Committees had invariably refused to sanction it. He therefore strongly supported the amendment proposed by his honourable friend (Mr. Lough).

On a division, the amendment was lost by a majority of 140; and the Bill was read the third time and passed.

The Directors of the European Gas Company, Limited, have decided to recommend the payment of the usual final dividend of 12s. per share on the fully-paid shares and 9s. on those on which £7 10s. has been paid; also a bonus of ½ per cent.—viz., 1s. and 9d. per share respectively.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, June 11.

(*Before Lords Justices* VAUGHAN WILLIAMS *and* STIRLING.)

Welsbach Incandescent Gas-Light Company v. Export Company.

Mr. NEILL said this was an appeal by the defendant from the order of Mr. Justice Day, in Chambers, granting an interlocutory injunction restraining the infringement of a patent—No. 124 of 1893. The grounds on which the defendant now relied were quite different from those on which he based his case in Chambers, and fresh evidence had been filed. In Chambers the defence was that there was no infringement; and, upon the evidence before the Judge, he thought he could not say that the decision was wrong. But the defendant now sought to get rid of the action on the ground of *laches*, and of the invalidity of the patent. The writ was issued on the 12th of February; and the defendant, in his further affidavit, said he had been trading openly for seven months previously, and had advertised his goods in the same papers as the plaintiffs. There was no doubt that the defendant had not a clean record in these matters, as he had been enjoined from infringing the 1885 patent, and for breach of the injunction had been committed to prison. At that time he traded as the Export Company, Limited, and he now traded as the Export Company.

Mr. WALTER remarked that it was a "one man" Company.

Mr. NEILL said defendant, being convinced that the patent was bad, had a right to have the question tried.

Lord Justice WILLIAMS said if there was a *primâ facie* case for granting an injunction, they ought not to interfere, as the Judge had rightly exercised his discretion. The appeal must be dismissed, with costs.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, June 12.

(*Before Mr. Justice* FARWELL.)

Batcheller v. Tunbridge Wells Gas Company.

This was an action for an injunction to restrain the defendants from polluting, by means of coal gas, or from otherwise interfering with or contaminating, the water supply of two houses of which the plaintiff was the owner in fee. The water supply of the houses was derived from a well situated in a garden about 210 yards distant; and it was conveyed to the houses by means of a pipe communicating with a pump. This pipe was laid for about 200 yards in, and passed under the surface of, the main road leading from Pembury to Lamberhurst, which is vested in the Kent County Council. The defendants have gas-mains in the same road; and the plaintiff alleged that, owing to their negligence and the defective state of their mains and service-pipes in proximity to the water-pipe, the water supply to his houses had been polluted, and rendered unfit for use. The defendants said their mains and pipes were laid in pursuance of their legitimate powers, and they were bound to use them for the purpose of supplying gas, which they were under a statutory obligation to furnish. They further said that the well in question was situated under the living-room of a cottage, and within a few feet of a cesspool; and that the water-pipe had been laid in an improper manner, and was in a leaky state, with imperfect joints. They denied that their mains or service-pipes had not been carefully laid, and said that, if the water supply had been contaminated, there was always, however well constructed gas-pipes might be, an unpreventible leakage sufficient to impregnate the surrounding earth, and possibly get into an adjacent water-pipe if defective.

Mr. UPJOHN, K.C., and Mr. G. LAWRENCE appeared for the plaintiff; Mr. JENKINS, K.C., and Mr. T. H. WATSON, for the defendants.

Defendants tendered evidence in support of their contention that the diffusion of gas was unavoidable, that their pipes were properly laid, and that the water-pipe was defective; but as it was objected to, it was ruled to be inadmissible.

His LORDSHIP, in giving judgment, said that on the facts there could be no doubt that the water had been contaminated with coal gas. Evidence had been tendered by the defendants to meet the plaintiff's case; but it was all irrelevant. It was quite true that the defendants had statutory authority to lay down pipes, and were required to supply gas to houses situated within a certain distance of their mains. But they were also bound by section 9 of the Gas-Works Clauses Act, 1871, which provided that they should not be exonerated from any indictment, action, or other proceeding for nuisance in the event of any being caused by them; and by virtue of that section, and of the judgment of the Court of Appeal in *Jordeson v. Sutton, &c., Gas Company*,* the defendants had no statutory authority to create a nuisance. Evidence had been tendered to show that the water-pipe was defective; but in this respect the case was governed by *Fletcher v. Rylands*. The laying of gas-pipes was a non-natural use of the land; and the Company laid them at their own peril. It had been decided by the House of Lords that if a person chose to bring a tiger upon his close, he was bound to have a chain strong enough to keep him there; and it was no answer to his next-door neighbour to say that, if he had made a strong iron fence, the tiger could not have got into his close. The plaintiffs owed no duty to the defendants to make their water-pipe gas-tight; and evidence could not be admitted as to the condition of the water-pipe. Lastly, the point had been taken that the water supply was otherwise unfit for domestic purposes. But this was quite immaterial to the present issue, as the facts proved that it was contaminated by gas. It being admitted that there was now no nuisance, the pipes having been relaid, he should not grant an injunction, but simply make a declaration that the defendants were not entitled to pollute the plaintiff's water supply with coal gas, with liberty to apply. Defendants must pay the costs of the action.

* See "JOURNAL," Vol. LXXIII., p. 1381.

Incandescent Mantle Litigation.—In the King's Bench Division of the High Court of Justice, last Tuesday, the adjourned summons of the Welsbach Incandescent Gas-Light Company, Limited, against the Birmingham Incandescent Lighting Company, Limited, was heard. After considering the affidavits of both parties, the learned Judge refused to grant an interim injunction. We are informed that the Birmingham Company are about to commence the manufacture of mantles which they will guarantee to contain absolutely no oxide of cerium.

MISCELLANEOUS NEWS.

BRADFORD CORPORATION AND THE CLAYTON GAS-WORKS.

The Purchase Settled.

At the Meeting of the Bradford City Council last Tuesday, the Chairman of the Gas Committee (Alderman Aykroyd) moved the adoption of the minutes of the Committee, which included an outline of the terms on which they asked the Council to sanction the purchase of the undertaking of the Clayton, Allerton, and Thornton Gas Company. He said the Company commenced to supply gas in 1865; but the works had been entirely reconstructed since 1883, and were now in good condition. In the last-named year, when one of the gasholders was destroyed by a severe gale, Alderman Priestman, who was then Chairman of the Gas Committee, suggested that the Company should accept £80,000 for their undertaking; but the Directors refused to sell upon any terms. In March, 1897, the Company offered to sell for £94,300, the Corporation to take over the £12,500 of 4 per cent. mortgage debentures and retain the balances. This offer was equal to 21·2 years' purchase of the maximum dividends, or 30¾ years' purchase of the dividends the Company were then paying. When in London in June last year, the Company asked for 31 years' purchase of the maximum dividends on the then capital, or £137,950. The Company called up further capital amounting to £3500, and spent upon the extension of their works during the year £4004. In August, 1900, after further negotiations, the Corporation offered £108,500; but the Directors finally refused to accept less than £120,000. The Company paid their maximum statutory dividends of 10 and 7½ per cent. last year for the first time. The Committee again met the Directors on the 20th of March this year, and, after further discussion, agreed to increase their offer to £115,000; but the Directors firmly refused to take less than £120,000. After further consideration, the Committee had unanimously decided to recommend the Council to accept this offer. The terms provisionally agreed upon were a cash sum of £120,000; the Corporation to take over the 4 per cent. mortgage loan of £12,500, and the Company to retain their reserve fund of £2683 (£1500 of this had been loaned to capital account, and would have to be repaid by the Corporation) and the balance at the credit of the revenue account £514. The sale to take effect as from Dec. 31, 1900, and maximum dividends to be paid until the completion of the purchase; the Company carrying on the works in the meantime. The Company's Manager and Secretary (Mr. J. Niven) to be compensated upon the usual terms.* Solicitors' costs of £52 10s. to be paid by the Corporation. The Committee believed the Council would do well to accept the offer. Since the negotiations in 1897, the business done by the Company had increased 14 per cent.; and the average value of gas undertakings had risen by several years' purchase. The proposed price was equal to 26 years' purchase of the dividends the Company were now paying. The minutes were adopted.

* Mr. Niven's compensation will be settled upon the Yeovil basis.

GAS AND ELECTRIC LIGHTING AT STAFFORD.

The Past Year's Working.

From the report of the Gas and Electricity Committee of the Stafford Corporation on the progress of the undertakings over which they have supervision, during the past financial year, we learn that the total make of gas was 165,344,000 cubic feet; being an increase of 7,491,000 cubic feet over that for the year 1899-1900. The unaccounted-for gas was 6·55 per cent. Coals cost the large sum of £11,888—being £3559 more than before; while the cost of manufacture was £8632, or an increase of £777. Income-tax paid was £472, against £283; and the interest and sinking fund charges amounted to £5644, against £5530. The total increase in the expenditure was £4638, equal to 25 per cent. more than the charges in the preceding year. There were, however, increases in residuals sales, &c., after deducting all expenses. The revenue from gas was £20,016, being a rise of £536; from coke, £5596, or £1901 more; from tar, £1476, or £111 more; from sulphate of ammonia, £1048, or £56 more; and that from gas-fittings showed a profit of £144, or £143 more. There was a balance carried forward of £273 more than in the preceding year, which, added to the increases in the receipts, amounted to £3022. Deducting this from the additional expenditure of £4638 there was a balance on the profit and loss account of £1615 13s. 5d. less than in the year 1899-1900. The gross profit for the past year was £8819, against £10,397. After deducting from this the sum of £1058 for depreciation, interest on loans £2494, income-tax, and the instalment on the sinking fund, there is a net balance of £2030 to be dealt with. This being the close of the second year of introducing profit-sharing among the workmen, the Committee express their pleasure in again setting aside a sum equal to 1·1 per cent. bonus to all employees in receipt of weekly wages, to which under the scheme the

men are entitled. They recommend that £1500 be transferred to the district fund in reduction of rates. The total capital expenditure for the gas undertaking has been £107,030, and the capital repaid amounts to £39,858—leaving £67,172 owing. The total paid out of profits in reduction of rates will, with this year's contribution, reach £36,525.

The electric energy generated at the electricity works for the year was 261,599 units, being an increase of 143,250 units, or 121 per cent.; and the equivalent in the number of 8-candle power lamps was 10,813, or 2255 more than before. The total revenue from electricity, meter-rents, &c., amounted to £2532; the total expenditure, to £1925, of which £718 18s. 10d. was for coals. The gross profit was, therefore, £607; being a decrease of £172. Interest charges and loans repaid amounted to £1154; and the debit balance at the end of the year, after allowing for the contribution from the rates last year, amounted to £503. The Committee propose to carry forward this amount.

Appended to the accounts of each department, are analyses by the Gas and Electric Light Engineer to the Corporation (Mr. Hubert Pooley, Assoc.M.Inst.C.E.). They show that the total working expenses of the Gas Department last year came to £8632 18s. 7d., equal to 10s. 4·04d. per ton of coal carbonized, and 13·59d. per 1000 cubic feet of gas sold. The net profit, with the balance brought forward, is equal to 2s. 5·16d. per ton, and 3·19d. per 1000 cubic feet. The increased revenue of £536 from the sale of gas is very satisfactory, seeing that the price was not raised. With regard to the electric light undertaking, there was at the close of the year a debit balance equal to 0·6d. per unit of electricity sold. Mr. Pooley gives the following figures at the close of his analysis of the accounts of the department: Percentage of total working expenses to gross revenue, 76; total revenue per kilowatt capacity of plant, £12 15s. 10d.; expenditure (working expenses) per kilowatt capacity, £9 14s. 5d.; revenue per 8-candle power lamp connected, 4s. 8d.; price charged for lighting, 7d. per unit for one-hour maximum demand, over that; 3d. per unit, or a uniform 5d. per unit, and no meter-rents in latter case; price charged for power, 2½d. and 2d. per unit; price charged for 10-ampere arc lamps per annum, £22 10s. each.

BURY CORPORATION GAS SUPPLY.

The Past Year's Working.

At the last Meeting of the Bury Town Council, the minutes presented by the Gas Committee included the annual report of the Engineer and Manager (Mr. H. Simmonds). It showed that the quantity of gas made in the twelve months ending the 31st of March was 364,239,000 cubic feet, of which 280,000 cubic feet were produced from benzol. The quantity sold to private consumers was 319,912,700 cubic feet; for public lighting, 27,913,600 cubic feet; and used on works and in lighting the public clocks, 7,327,500 cubic feet—making a total of 355,153,800 cubic feet, and leaving 9,085,200 cubic feet, or 2·5 per cent., unaccounted for. The total cost of gas was at the rate of 2s. 2·24d. per 1000 cubic feet; while the income was 2s. 5·62d.—showing a profit of 3·38d. For the current year, the cost is estimated at 2s. 4·11d., and the revenue at 2s. 5·50d.—or a profit of 1·39d. Referring to the work of his department, Mr. Simmonds said: "In the year ending March 31, 1901, we had a total of 2174 lamps connected to our mains; and there have been added this year 69—showing now a total of 2243. Last year we had 1332 cooking-stoves in use, and have this year fixed 413, and brought out 208—giving a total of 1537. We have now in use 1445 grillers, or an increase of 375 over last year end; 1400 prepayment meters were in use at the close of the year; 732 new meters have been fixed, varying in size from 2 to 150 lights; eight additional gas-engines have been fixed, varying in size from 1 to 20 horse power (nominal), making 79 now in use; 88 gas-fires have been fixed, also 10 boilers; and 2371 yards of new mains have been laid, varying in size from 3 to 16 inches internal diameter." Mr. Byrom, in moving the confirmation of the minutes, said the Committee were pleased that the profit made had exceeded the expectations of the Manager; and he felt sure every member of the Council would be gratified with the result. Residuals had yielded far more than had been reckoned; and instead of there being a profit of about £2500, they had one of £4667. As to the working of the undertaking in the current year, it was anticipated that they would have a reduction in the price of coal, but they did not propose to lower the charge for gas, as, with the fall in coal, it was expected that there would be a drop in residuals, and that therefore the working cost would not be much less. However, they looked for a profit of about £2050. It had been decided, as he had said, that the price of gas should not be altered—it would remain at 2s. 4d. per 1000 cubic feet; but with the return of 1d. per 1000 feet as a share of the profits, and 1d. per 1000 feet for prompt payment, the price would be 2s. 2d. If they compared their works with other concerns in towns of a similar character to their own, they would find that Bury occupied a favourable position. He had taken five concerns, which produced on an average 334 million cubic feet per annum. At Bury the profit on the capital expenditure was equal to 11·4 per cent. for the past year, against an average of 8·7 per cent. for the five concerns he was taking. They sold the gas at 2s. 2d. per 1000 cubic feet, while the average price for the other five towns was 2s. 7d. He thought Bury compared very favourably with those other places; and if they were selling their gas at 2s. 7d. per 1000 cubic feet, they would be able to make a profit equal to 16·1 per cent., against the average of 8·7 per cent. for the five towns. The Manager had told the Committee they had one of the best investments of any town in Lancashire. Questions had been raised about the purity of the gas; but the Committee were satisfied that their works were producing gas which, for quality and cheapness, would compare with any in the country. The minutes were confirmed.

At the last meeting of the Burslem Town Council, Mr. E. Leigh, the Chairman of the Gas Committee, stated that there had been a considerable increase in the consumption of gas during the past year, owing to the popularity of slot meters.

NEATH CORPORATION GAS SUPPLY.

The Past Year's Working.

At the last Meeting of the Neath Town Council, the minutes of the Gas Committee set forth that the Gas Engineer and Manager (Mr. R. A. Browning) had presented his report on the working of the undertaking during the past financial year. It showed that out of the £75,500 borrowed, £46,937 had been repaid; leaving a balance of £28,563. The expenditure on capital account last year was £2067. As there was a debit balance of £1682, this account is overdrawn to the extent of £3750. With regard to the revenue account, owing to the rapaciousness of the colliery proprietors, coal cost £2000 more than in the previous year. There was an increase of about £100 in wear and tear, and of £200 in stokers' wages, due to the eight-hour system and higher pay, with less work done. The total expenditure was £2400 more than in the year 1899-1900. On the other hand, there was an increase of £1300 in the revenue from the sale of gas; and the total receipts were £1400 more. The gross profit was £2735; being a decrease of about £1000. After paying £1284 for interest and £1627 in reduction of the principal, the balance on the profit and loss account was £3837. The Gas Committee did not raise the price of gas last year; and Mr. Browning approves the policy as a sound one, in the interests alike of the consumers and of the gas undertaking. To meet the extra cost of coal, it would have been necessary to raise the charge for gas from 3s. 2d. to 3s. 9d.—an additional 7d. per 1000 cubic feet. There was an increase of upwards of 15 per cent. in the consumption of gas last year; while the quantity of coal carbonized was only 6 per cent. more than in the preceding twelve months. The improvements carried out at the works enabled Mr. Browning to produce more economical results; his make having increased to 10,000 cubic feet per ton of coal. Since the extensions, more than £1700 has been taken from the profits for a portion of the work which should have been paid for out of revenue; and this has raised the structural value of the works. Mr. Jones moved the adoption of the report, and said they could congratulate themselves on the condition of the accounts. They would have had a better result but for the coal strike. Mr. Bevan seconded the motion. Mr. Morgan supported it, and commended the Manager on the report. What had been done fully justified his recommendations. There had been very excellent results on last year's working. The minutes were passed.

THE HORSHAM AND PINNER PROVISIONAL ORDERS.

Board of Trade Reports.

Our readers may remember that the Horsham and Pinner Gas Companies have applied to the Board of Trade for Provisional Orders under the Gas and Water Works Facilities Act, 1870, and as, in each case, the consent of the Local Authorities concerned (the Horsham District and the Pinner Parish Councils) was refused, the Board commissioned Mr. Ingram B. Walker to inquire into the matter. As the result, they have decided to dispense with such consent, and have set forth their reasons for so doing in reports which have lately been presented to the House of Commons.

In the case of the Horsham Company, the application was for power to maintain and continue additional gas-works erected by the Company without statutory authority on land adjoining the site of the existing works, which were authorized by the Horsham Gas Order, 1877. After Mr. Walker had inquired into the matter, he reported that he saw no reason for refusing to accept the plea of the applicants that it was by inadvertence that the additional works had been erected on an unauthorized site; that to meet the demand for gas the Company must increase their producing plant; and that if they were obliged to reconstruct the additional works on a portion of the site already sanctioned, the community as a whole would not gain. He recommended, therefore, that an Order should be granted, but that the use of a part only of the proposed new site should be sanctioned.

The application by the Pinner Gas Company was made under their Order of 1881, and was for power to construct additional works and to raise further capital. The only consent required was that of the Pinner Parish Council; and the promoters, having failed to obtain this, asked the Board of Trade to exercise their power of dispensing with it. The Council were not represented at the inquiry held by Mr. Walker; and, after hearing representations made on behalf of individual objectors and of the promoters, he recommended that the Order should be granted.

Leigh (Lancs.) Gas and Water Accounts.—An abstract of the accounts of the Leigh Corporation gas undertaking shows that for the first time for some years there is a loss, due primarily to the Town Council last year declining to raise the price of gas notwithstanding the large advance in the cost of coal. The loss is £1805 on an expenditure of £25,772, £7353 of which was for coal and £2435 for cannel, against £5103 and £1794 respectively in the previous year. Carbonizing cost £1125; rents and rates, £1194; interest on loans, £3677; and the sinking fund, £1458. A sum of £450 has been allowed for estimated discounts on the March quarter's rental, now included for the first time (the financial year ending at March 31); and £229 has also been written off for special depreciation of old meters. A more serious charge upon the gas estate is that for street lighting, which, with repairs to public lamps, &c., is responsible for an expenditure of £2425. The Town Council have had under consideration the advisability of making the street lighting a charge upon the general district rate; but they decided to leave it to come out of the gas undertaking as at present. The chief sources of revenue during the past year were: Gas-rental, £17,863; coke, £3730; tar, £1555; and profit on sulphate of ammonia, £471. There was a net profit of £1885, and a sum of £2368 was voted out of the gas fund in relief of the rates. The water undertaking produced a profit of £135, against £203 in the previous year.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Company was held last Tuesday, at the London Offices, No. 60, Gracechurch Street, E.C.—Colonel J. Le Geyt Daniell in the chair.

The Secretary (Mr. A. W. Cooper) read the notice convening the meeting and the report of the Auditors; and the Directors' report (which was noticed in the "Journal" for the 28th ult., p. 1466) was taken as read.

The Chairman said that, when addressing the shareholders last year, he expressed his great regret at the absence (and its cause) of their old friend and Chairman, Mr. J. Birch Paddon; and he could assure them that it was with feelings of sorrow, shared by his colleagues and also, he was sure, by the general body of shareholders, that the cause of Mr. Paddon's absence from the last meeting, added to the weight of years, necessitated his resigning some time afterwards his position, not only as Chairman, but also as a Director of the Company. He was sure that if Mr. Paddon could have anticipated such a year as the Company had experienced, he would have hesitated before following his medical advice, and at whatever risk and personal sacrifice he would have remained with them to see things straightened out. Not that he thought it would have made any difference under the circumstances which had affected the operations of the Company; but the shareholders would have had the advantage of Mr. Paddon's presence at the meeting. The Directors thought that, in the interests of the Company, they could not do better than elect Mr. Arthur M. Paddon to the vacancy created by his father's resignation; and he for one could not be too thankful for having a man of Mr. Arthur Paddon's experience in all matters relating to the gas profession to appeal to. His colleagues had done him (Colonel Daniell) the honour to elect him Chairman; and it had fallen to his lot to commence his office in a year of unusual depression not unaccompanied by some anxiety. Those of the shareholders who were conversant with the nature of the Company's business no doubt anticipated a good deal of what was stated in the report. But speaking for himself and his colleagues, he would express a hope—and a very confident hope—that the circumstances which had retarded the progress of the Company (or perhaps he would be more correct in saying which had affected their profits), were of a transient rather than a permanent character, and that with a return to the normal position of affairs they would revert to their usual condition of prosperity. And, in this connection, he would state that the arrangements which the Directors had made for the ensuing year were very much better than those for the preceding twelve months, and should go far during the present year to counteract the very largely increased expenditure under the item of coals. They had made their contracts for the current twelve months, and considered them to be very satisfactory. Before going into details of the accounts, he might mention that the coal carbonized during the year under review was 11,084 tons, which showed an increase at all the Company's stations of 1092 tons. The quantity of gas sold was 89,510,000 cubic feet. The increase in the cost of coal alone was £5727. This adverse state of things had in a measure been counteracted by such an increase as it was possible or prudent to make in the price of gas, and also by the enhanced price of residuals, which, taking coke and tar together, produced about £6473, or an increase of £1850. Coming to the profit and loss account, on the debtor side the item of gas making showed a small increase of £176, for which the Malta station was principally responsible; but they had been led by the Manager to expect a rise in wages. This remark applied equally to the charge for purifying materials, which showed an increase of £117. Rents, rates, and taxes showed a decrease of £422, as compared with last year; but it should not be forgotten that in the preceding twelve months this item included the Government impost at the Sicilian stations. This impost the Company had resisted for some time; but ultimately they had been obliged to submit to it. It was a burden, however, which was not likely to occur again. General trade charges exhibited an increase at all the stations of £277. On the other side of the account, fittings and meters showed an increase of £118. There was nothing in the general revenue account to which attention need be called; but on the credit side of the balance-sheet stocks showed an increase of £1003. This was, of course, accounted for by the higher prices of coals and residuals. Sundry debtors figured at £1106 more. The question of Corfu had often been referred to at previous meetings. It was in regard to a debt incurred by Corfu before the Company sold their interests there. This year, on ascertaining that the Municipality had succeeded in raising a loan, and having obtained nothing beyond assurances in answer to their several demands, the Board despatched the Secretary to the place; and he quickly succeeded in obtaining in settlement some £2000. Therefore the item of Corfu indebtedness came out of their books altogether. The amount invested in India stock stood at £1000 less, which represented that amount of debentures paid off. Sundry creditors figured at £3990 more. There were times and occasions—particularly when prices of coals, &c., were high—when everyone had to finance a little; but all these things righted themselves in time, and he thought that the arrangements which the Company had made for the current year would afford them considerable relief in that respect alone. Taking the stations separately, at Malta the quantity of gas made was 85,907,000 cubic feet. There was a small reduction in the private consumption, which was 270,900 cubic feet less than in the previous year. This was attributable to the cessation of all public and private functions and engagements such as are usual during the Malta season, owing to the death of the Queen, and also to the greatly extended use of incandescent burners, which the Board encouraged as far as possible. Against these burners the electric light, for private purposes, did not seem to succeed. The increase in the receipts for gas (amounting to £1100) had, he was sorry to say, been more than counteracted by an unaccountable leakage at Malta. In using the expression unaccountable, he meant to convey that no practical reason could be assigned for it. The Directors immediately took active steps to ascertain the cause and put the matter to rights. It had occurred to the Directors when they saw their Engineer over here last year, that in a short time they would have to give that gentleman (who was advancing in years) some assistance; and without waiting, when this occurrence became apparent, the Board at once availed themselves of the services of Mr. Wilson, of whom they received an excellent account. He was sent out to take charge of the works and distributing system, with the assistance, in an advisory capacity, of their old Engineer, who was thoroughly conversant with everything in Malta, besides speaking the language. They were, however, not without encouragement as to the future; and even in the present accounts the meter, fittings, and stove rentals at Malta showed nearly 10 per cent. increase. The profit on the fittings department was £548, or 10 per cent. over previous years, and the highest for the last ten years. Further extensions, to which he alluded last year, had been made at Sliema, and many new customers obtained. Other extensions would be required this year, as the district was opening up rapidly. There was a larger quantity of gas cooking apparatus in this place than in any other supplied by the Company. The total number of stoves on hire had increased by over 30 per cent.; more than one-third being in use at Sliema alone. With regard to the other stations—Trapani and Marsala—he did not think there was much to say; but in the matter of their indebtedness they all wanted watching. The financial position of some of these Italian Municipalities was decidedly fluctuating. They periodically had recourse to loans; and then the Company were able to come to a settlement, as in the cases of Marsala and Corfu. It would be the same with Trapani, where a loan was at present being negotiated. He now came to the dividend, which was rather a disagreeable subject, because it was 2 per cent. less for the year than it was for the last and preceding years. It was very disappointing to the Board that, from causes which he had endeavoured to put before them, they were not in a position to recommend a dividend of more than 4 per cent. for the year. It would be imprudent to pay more than this; and he was sure the Directors would have the support of the shareholders in limiting the dividend as they had done. He concluded by formally moving the adoption of the report and accounts.

Mr. A. M. Paddon, in seconding the motion, remarked that every gas undertaking had during the past year been similarly circumstanced to themselves. The Chairman had expressed the belief that this state of affairs was a transient one; and he (Mr. Paddon) held the same view. The coal people had been struck with a sudden inspiration, and had created a heaven for themselves and the antithesis for everyone who had to deal with them. With regard to the new Engineer, he felt sure they might repose considerable confidence in him; but it was distinctly unhappy that the failure of an old servant should synchronize with the time when the accounts of the Company were in such a disappointing condition.

Mr. A. W. Oke asked whether the export duty on coal would be likely to seriously affect the Company. With regard to the retirement of Mr. Paddon, they had lost a valuable Chairman; but he thought they were very fortunate in securing the services of Mr. A. M. Paddon. As to the fall of 2 per cent. in the dividend, he was sure it must be gratifying to the consumers to feel that the proprietors were willing to share with them the burden of the increased cost of coal.

The Chairman said, with regard to the coal tax, of course they would have to pay the 1s. per ton; but this had been taken into consideration, and when the tax was added to the contract price the figure was still satisfactory.

The motion having been carried unanimously,

The Chairman proposed, and Mr. Basil T. Makins seconded, the payment of a dividend at the rate of 7 per cent. per annum on the first preference shares, 7½ per cent. per annum on the second preference shares, and 4 per cent. per annum on the ordinary shares, less the payments already made on account.

This was agreed to; and the retiring Director (Mr. Stephenson R. Clarke) and the Auditors (Mr. R. Hesketh Jones and Mr. Thomas Guyatt) were re-elected.

The Chairman proposed a vote of thanks to Mr. Cooper, Mr. Starkey, Mr. Marino, Mr. Torrini, and the staffs acting under them.

Mr. Joseph Cash having seconded the resolution,

Mr. Cooper briefly replied; and the proceedings terminated with a similar compliment to the Chairman and Directors.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Southwark Bridge Road, on Tuesday last—Alderman Sir H. E. Knight presiding.

The Secretary (Mr. Montague Watts) having read the notice convening the meeting,

The Chairman moved the adoption of the report and accounts. The latter, he pointed out, were not signed, as usual, by the Government Auditor, as Mr. Stoneham had a doubt whether in previous years he had rightly interpreted the Act of Parliament as regarded the sinking fund clause. This gentleman had acted in a certain sense ever since this clause was invented by Parliament many years ago; but he now declined to certify the accounts until he was satisfied on the point on which he was in doubt, and upon which he was taking Counsel's opinion. This was all that was meant by the absence on that occasion of Mr. Stoneham's signature to the accounts. He (the Chairman) had been in hopes that the report submitted to the proprietors on that occasion would have brought a larger number of them to the meeting. The Directors met them that day in anomalous and exceptional circumstances—as the Board of a prosperous and advancing Company, advancing both in revenue and in profit; and yet they had less money to distribute as dividend. This, however, was a position which he could not but regard as temporary, brought about by external circumstances over which the Board had no control. His colleagues had thought it well to circulate among the proprietors the speech which he delivered about a fortnight previously when they commenced their large reservoirs at Molesey. On that occasion, he dealt rather fully with the Company's position as regarded their capabilities of doing their work. For many years (in his own experience for about 25 years) the Directors had been carrying out the mandate which they had received from the proprietors from time to time to put the plant and works of the Company in an unassailable position—in a position to

enable them thoroughly to perform all the duties imposed upon them. This mandate his colleagues and himself had faithfully carried out, with the result stated in the speech referred to. If, as he hoped, the proprietors had read the speech, he thought that they could not but be thoroughly satisfied that the Directors had spared no pains or trouble to place the Company in the position they now occupied. This had not been accomplished without very great difficulty and considerable expense; but in all that they had done they had not only borne in mind what the proprietors wished, but they had also had to fall in with the requirements of Parliament and to execute works in a manner very different from that in which they were carried out by their predecessors. The whole of these works, however, now appeared to have been brought to a conclusion, except the extended reservoirs, and one or two other things which the Company were bound to carry out under their Act of 1898. The total amount which had to be spent by them under that Act was £650,000; and the outlay would be incurred in the next seven or eight years. The incubus would therefore fall upon the Company gradually; and they would be quite able to meet it. They would then be in a position—as they were now—not only to satisfy the requirements of their district, but to come to the aid, as they did two years ago, of any Company in difficulty, and afford them a supply up to 10 or 12 million gallons a day. After a few years, they might not have a surplus supply to give; but their own Company would be safe for a period of time long beyond that which he thought any of those whom he was addressing would live to see. Years ago, before the works to which he had referred were commenced, the Directors went fully into the financial question; and he found that the Company might certainly calculate on an increased revenue of about £5000 per annum. They then made up their minds that they would be able to afford an outlay of capital which would require about £3000 per annum—leaving £2000 for extra dividend. This estimate had been more than maintained; and the principle they had adopted and carried out so far had been to rely on a normal increase of £6000 a year in the Company's income, and an outlay of about £100,000 a year to bring their works up to a proper condition—leaving £3000 margin available for increasing the dividend. This amount had been available, and it would now be available, but for abnormal circumstances beyond the Directors' control. For the year ended March, 1897, the increase in the water-rental was £11,510; for the following year it was £9739; for the year to March, 1899 (deducting the extraordinary receipt they had from the East London Company), the increase was £7661; next year, it was £9477 (again deducting the extraordinary amount received from the East London Company); and for the year 1901, an increase of £6751 was shown. The total increase in these five years was £45,000 odd, representing an average annual advance of £9000. He maintained that this showed they were prosperous. In answer to Mr. Makins, he stated that the figures he had mentioned were gross. He gave the gross amounts, that being the fairest way to enable the proprietors to judge of the prosperity of the Company, because the net result was affected by abnormal circumstances. Continuing, the Chairman stated that the Directors did not calculate on the average annual increase of the last five years; they preferred to calculate on an improvement of £6000. The proprietors would have noticed that the increase in 1901 was the lowest of any of the five years he had mentioned. The increase depended largely on circumstances which it was impossible for the Directors to control; but it was a fact that in the past year the advance in the Company's water-rental had been only £6750. Abnormal charges had affected the profit, and coal had had an enormous bearing on the question of the amount available for division among the proprietors. The Company were now practically paying £1 2s. 10½d. a ton, as compared with 13s. 2¾d. in the March half of 1899. The quantity of coal consumed had not been so great; but nevertheless the amount paid in the past half year, compared with that paid in the March half of 1899, showed an increase of £5845, which alone represented 1 per cent. dividend in the half-year's accounts. This was a matter to which the proprietors' attention ought to be called; and he was quite sure that they would agree with him that it was an altogether unexpected item. Adding together the extra amounts paid for coal in the last three half years, the sum was equal to a total loss of £13,710, which represented a dividend of nearly 1 per cent. in each of those half years. Two new capital accounts had been opened by the Directors on the present occasion in connection with the intercommunication works, it having been thought best to keep this matter separate from the Company's own capital account, which showed an unexpended balance of £38,285. This would not carry them through the half year; and therefore the Directors would very soon have to make a further issue of 3 per cent. debenture capital, to meet the outlay on works in progress. Turning to the revenue account, he stated that there was an increase in the maintenance expenses, as compared with those of the corresponding period of the previous year, of £3156, of which coals were responsible for £2770 and higher rates for the balance. In the management expenses, the increase was £329, owing to the larger amount paid for legal expenses. This was caused by an action brought against the Company by the Battersea Vestry, who took them before the Railway Commission on account of some samples of water which had been drawn from the Company's main, and which were alleged to have been not properly filtered. The case was thoroughly tried before Mr. Justice Wright, who, in giving his decision, complimented the Company very highly; stating that they had done more than could have been expected of them in order to ensure the good quality of their water, and that the reports of the Government Analysts were at variance with the local Analyst's report on which the Battersea Vestry had acted. The Judge also dwelt on the fact that the Company were not apprised as to the time when the samples were to be obtained; and therefore they did not know the circumstances under which they had been taken. While being entirely in favour of the Company, however, Mr. Justice Wright declined, for reasons which he (the Chairman) could not understand, to give them costs in the action, which amounted to about £700—it having been determined to completely substantiate the position of the Company. In addition to the increases mentioned of £3156 and £329, a larger amount by £640 had had to be paid to the Chamberlain's sinking fund. On the other side of the account, it would be seen that the water-rents accrued were £138,365, or an increase of only £804 on those for the March half of 1900. These figures, however, had to be corrected. The amount of £137,561 received in the corresponding period last year included £3150 from the East London Company; and deducting this exceptional receipt for the purposes of fair comparison, the normal increase in the revenue in the half year under review was £3954. The payment of £3000 more for debenture interest had been brought about from circumstances not within the Directors' control. They used to raise debentures concurrently with their expenses; and this was a far better system of finance than that which they were afterwards compelled to adopt, and which had forced the Company to pay interest on £100,000 of debentures a year earlier than would otherwise have been necessary. These sums together made a difference of £12,000 or £13,000, which would have been available for dividend but for the abnormal circumstances mentioned. In connection with the Hampton station, preparations had been made in order to do away with the Battersea station; but when the question arose of disposing of that property to the other Companies for the intercommunication scheme, the Directors decided, in the interests of the proprietors, to keep the station as a going concern, instead of one which had been shut up. If, however, it had been closed, the Engineer informed him that the Company would have been saved an expenditure of £10,000 a year—a large amount, but small compared with the importance of disposing of the station to the best advantage. The amount applicable to dividend was £31,756, or £15,550 less than was available a year ago. The difference was accounted for as follows: The sum brought forward was £8862 less; there was a reduction of £3708 on profit account; and £3000 more had had to be paid for debenture interest. The Directors proposed a dividend of 6 per cent. per annum; leaving £895 only to be carried forward. But they were dealing with what was called their bad half year; the current half was the better period. It could be faced with perfect confidence; and he believed that at the end of another six months the Directors would be able to meet the proprietors with a far more favourable report. He had received a letter from a proprietor, who naturally felt a little sore at having to take a dividend of 6 per cent. instead of 7½ per cent.; and he asked why the Company were not able to pay the same dividend as before, notwithstanding the higher price of coal, seeing that the other Companies were paying the same dividends, and that some of them were even carrying forward a larger balance. To an outsider, the matter might be rather puzzling; but he had not the slightest difficulty in amply accounting for it. It all hinged on the fact that theirs was a very poor district, while other Companies had rich districts. Their Company took 30s. per house; and the Chelsea Company, for instance, took £4. A man who lived in the lower-rated house wanted fully as much water as the man who paid the higher rate. Thus, while the Southwark Company would have a larger increase in the consumption of coal for pumping against a smaller revenue, the Companies who were more fortunately situated would have a smaller increase in the coal payments together with a larger revenue. There was also the question of new supplies, which last year numbered 1250 in the case of their Company, as compared with 7200 in the case of the East London Company.

Mr. C. M. VIALLS seconded the motion.

Mr. MAKINS asked for further explanation respecting the Battersea station.

The CHAIRMAN, in reply, stated that the aim of the Directors for many years had been to shut that station up; and provision had been made for doing so at the works which had been erected at Hampton. In connection with the intercommunication system, however, an arrangement had been made with the other Companies under which the latter would take a portion of the station. When, however, it was shut up, their Engineer stated that the Company would save about £10,000 a year in expenses. The arrangement was a very satisfactory one to all the Companies.

The motion was adopted; and the dividend recommended was afterwards approved.

A vote of thanks to the Chairman, Directors, and staff brought the proceedings to a close.

GRAND JUNCTION WATER-WORKS COMPANY.

The Half-Yearly General Meeting of the Company was held at the Offices, South Molton Street, last Wednesday, under the presidency of Mr. FREDERICK TENDRON, F.G.S.

The SECRETARY (Mr. J. Goodwin) having read the notice convening the meeting,

The CHAIRMAN said the Directors were able to present very satisfactory figures of the half-year's working, despite the high price of coal and the large expenditure which had had to be incurred, as usual, in order to maintain the works in a state of the highest possible efficiency. The normal receipts and expenditure on revenue account showed a surplus available for dividend and interest purposes of £62,996; and after deducting the dividend on the "C" and "D" shares, there remained available for the maximum dividend payable to shareholders entitled to 10 per cent. a sum of £41,332. If they would take the trouble to work the figures out, they would find that the receipts amounted to a percentage of 4·88 for the half year; or at the rate of 9¾ per cent. per annum. The amount which had been earned towards the maximum dividend in the preceding three years worked out at an average of 9 per cent. per annum; and yet during the period of three-and-a-half years they would only have received an average dividend of 7⅝ per cent. per annum. The difference between those rates was partially accounted for by payments on account of interest for the Staines reservoirs works, which now amounted to a total of rather over £18,000; and, in addition, there was a sum of no less than £25,508 which had to be carried forward in order to enable the Company, when the reservoirs were finished and in operation, to meet the additional charges which would then come upon them for sinking fund, rates and taxes, and pumping and working charges. Mr. Justice Buckley had decided that these payments of interest were to be regarded as a revenue charge. This decision was not exactly in the nature of a surprise to the Directors, although they would, of course, have preferred a capitalization of the amount, as there would then have been a very large sum in hand to meet the heavy charges which would eventually come upon the

Company. When a company anticipated future requirements and took measures with the object of giving a full supply of water to their district—thus rendering a great service to the community—it was very strange that, instead of what they were doing being appreciated, a large amount of prejudice was created in the minds of the public. He feared this prejudice even affected some members of the House of Commons itself; a Committee of that House being prepared to make a deliberate attack upon what he must call a contract. The Company went to Parliament, and undertook to do certain works and to find the money necessary for the purpose. When, however, they sought for powers to raise the money, Parliament would only grant them on conditions which were made most onerous. A monstrous charge in connection with the Chamberlain's fund would fall on the New River Company in relation to the Staines reservoirs works; and, in addition to this, a sterilization clause was put in the Act preventing the Companies interested from claiming any benefit from the works if the undertakings were bought by a public authority within a period of seven years. It was with some hesitation that the Directors of the Grand Junction Company accepted the very onerous charge as to the sinking fund; and it was quite a question whether they would withdraw, when Parliament required the inclusion of that condition. However, notwithstanding all this, and without their consent, the House of Commons Committee actually listened to the London County Council, the known enemy of the Water Companies, and extended the sterilization clause to which he had referred for a period of three years longer—namely, from 1903 to 1906. He then referred to, and condemned, the damaging statements which were publicly made against water companies, and remarked that it was impossible, however much directors might do on behalf of their shareholders and the public, to escape from these attacks. A proprietor had sent him an extract from a London newspaper containing a report of a speech recently delivered at Poplar Hall; and the person who made this speech was described in the paper as speaking with authority, from the fact that he was Vice-Chairman of the London County Council and a member of the Thames Conservancy. In this speech, Mr. M'Dougall was reported to have said: "In the Thames Valley above London, a million-and-a-half of people live. Every drop of sewage from that valley goes into the Thames before you drink the water." This was the statement of a man who was a member of the Thames Conservancy and of the Pollution Committee, and who knew all about sewage and such matters. He also knew that the Conservancy had under their control everything that ran into the Thames; and he was aware of the efforts which the Conservancy had been making in order to ensure purification. Moreover, Mr. M'Dougall could refer to the report of the Local Government Board for the exact state of affairs. If he had done so, he would not have made the statements in question; for the report (which was official, and was made by independent chemists) stated that the amount of the ammonia in the river water was 0·01 in 100,000 parts, and that in the filtered water—the water supplied by the Companies—there was no trace. Thus, one of the elements of sewage—ammonia—had been eliminated; and, as regarded matter in suspension, before a man could get a single grain into his system, even if it could be accumulated, he would have to drink no less a quantity than 500 tumblers of water every year for ten years. In face of these facts, Mr. M'Dougall was not justified in speaking publicly to ignorant people—and they must have been ignorant, because the statement was not contradicted by them. Nor could he understand how a paper like the "Lancet" could use the language which it had employed in regard to the Company's water, and say that it was "the dirtiest water in London." When, however, their attention was called to the phrase, the "Lancet" only proceeded to write a very long paragraph, in which reference was made to dirt being matter in the wrong place. But the Company were not responsible if the water they supplied was taken from cisterns which were not clean. The public in the East-end of London had to drink water; and yet the Vice-Chairman of the County Council, an apostle of temperance, and a most scrupulous teetotaler, endeavoured to frighten the people about the quality of the water that was supplied to them. Why did he make such statements? This brought him to the subject of the regulations in connection with the water supply, which had been met in such a hostile spirit that the Companies had felt compelled to withdraw them. One of the most important provisions for the benefit and improvement of the water supply in the east of London had been frustrated—a tap upon the rising main, which was not a very expensive thing. If cisterns in the East-end were not cleansed, but were allowed to get into a filthy condition, the people there should drink water from the tap on the rising main. The Companies in times of drought could keep the cisterns fully charged; but the people need not use the water in them for drinking purposes. There were other domestic purposes for which the supply in the cisterns would be available, and for which the water could be used, even if it were a little dirty. He was prepared to state that nine-tenths of the people in the East-end had not at the present moment sufficient cistern accommodation in their houses. The statement which had been made as to the expense that would have been involved by the regulations was absurd. Another charge brought against the Company was that they were grasping—that they only attended to the interests of the shareholders, and cared nothing about those of the public. Let them see what their own "grasping and monopolist Company" got upon their outlay, which had amounted to no less than £1,841,475 on works. The return had averaged as nearly as possible 6 per cent. per annum. Would any tradesman whose business had been carried on in the streets around them for a hundred years be contented with such a return? He might be met with the statement that the Company had been able to pay a dividend at the rate of 8 per cent.; but the return to the buyers of any of the Company's stocks for over twenty years had been less than 4 per cent. per annum. They were going to sell that day "D" shares to the amount of £30,000. These would carry nominally a dividend of 7 per cent.; but he would be very much surprised if the price paid for the shares would yield the buyer much over $3\frac{3}{4}$ per cent. In conclusion, he remarked that it was only by trying to make the public understand the absurdity of the charges which were brought against the Water Companies that the latter might hope to reach the authorities—.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1666.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	$10\frac{1}{2}$	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	$7\frac{1}{2}$	Do. 7 p.c.	13—14	..	5 7 2
500,000	100	Jan. 2	5	Australian 5 p.c. Deb.	103—104	..	4 16 2
200,000	5	May 15	$6\frac{1}{2}$	Bombay, Ltd.	6—6½	..	5 0 0
40,000	5	,,	$6\frac{1}{2}$	Do. New, £4 paid	4¼—4⅝	..	5 9 5
380,000	Stk.	Feb. 14	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New	190—195	..	4 12 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—132	..	3 15 9
159,375	,,	June 14	4	Do. 4 p.c. Deb.	111—114*	..	3 10 2
220,000	Stk.	Mar. 14	10	Brighton & Hove Orig.	222—227	..	4 8 1
226,320	,,	,,	7	Do. A. Ord. Stk.	155—160	−3	4 7 6
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max.	121—123	..	4 1 4
420,000	20	Mar. 28	10	British	41—42	..	4 15 3
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c.	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c.	19—21	..	4 5 8
500,000	10	May 31	6	Buenos Ayres (New) Ltd.	8½—9½	..	6 6 4
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—98	..	4 1 8
150,000	20	Mar. 14	$8\frac{1}{2}$	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	May 31	10	Cape Town & Dis., Ltd.	14⅜—15⅝	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
550,000	Stk.	Apl. 12	12	Commercial Old Stock	270—280	−2½	4 5 9
236,425	,,	,,	9	Do. New do.	205—210	..	4 5 9
238,237	,,	June 14	$4\frac{1}{2}$	Do. 4¼ p.c. Deb.	125—130*	−2½	3 9 3
800,000	Stk.	May 31	9	Continental Union, Ltd.	160—165	..	5 9 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
486,030	10	Jan. 31	11	European, Ltd.	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,079,885	Stk.	Feb. 14	$4\frac{4}{10}$	Gas-light and Coke	4 p.c. Ord.	95—97	.. 4 10 9
2,600,000	,,	,,	$3\frac{3}{4}$		3½ p.c. max.	90—92	.. 3 16 1
3,792,735	,,	,,	4		4 p.c. Con. Pref.	108—111	.. 3 12 1
4,063,425	,,	June 14	8	Coke	3 p.c. Con. Deb.	92—94*	.. 3 3 10
70,000	10	May 31	8	Hongkong & China, Ltd.		13—14	.. 5 14 4
3,800,000	Stk.	May 15	10	Imperial Continental		208—212	+½ 4 14 4
473,600	Stk.	Feb. 14	$3\frac{1}{2}$	Do. 3½ p.c. Deb. Red.		100—102	.. 3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A		234—236	.. 4 4 9
678,100	,,	,,	7	Do. do. B		172—176	.. 3 19 7
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.		120—122	.. 3 5 7
75,000	5	June 14	4	Malta & Medn., Ltd.		4½—5⅜	.. 4 0 0
560,000	100	Apl. 1	5	Met. of	5 p.c. Deb.	105—108	+1 4 12 7
250,000	100	,,	$4\frac{1}{2}$	Melbourne	4½ p.c. Deb.	102—104	.. 4 6 6
541,920	20	May 31	$3\frac{1}{2}$	Monte Video, Ltd.		9—10	.. 7 0 0
717,946	Stk.	Feb. 22	$8\frac{1}{2}$	Newc'tle & G'tesh'd Con.		230—231	.. 3 13 7
312,855	Stk.	Dec. 28	$3\frac{1}{2}$	Do.	3½ p.c. Deb.	93—101	.. 3 9 4
150,000	5	May 15	8	Oriental, Ltd.		6¾—7¼	.. 5 10 4
135,000	5	,,	8	Do. New, £4 10s. pd.		5⅜—6⅛	.. 5 15 3
15,000	5	,,	8	Do. do. 1879, £1 pd.		1¼—1⅝	.. 4 11 5

*Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd.	5⅜—6⅛	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord.	10¾—11¼	..	6 4 5
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
250,000	10	Mar. 28	8	San Paulo, Ltd.	11—12	..	6 13 4
135,000	Stk.	Mar. 14	10	Sheffield A	235—240	..	4 3 4
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
523,498	,,	,,	10	Do. C	232—234	..	4 5 6
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	125—128	..	3 18 2
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	93—96	..	3 2 6
380,940	Stk.	May 15	5	Southampton Ord.	106—111	..	4 10 1
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham and Edmonton	A. 5 p.c.	115—120	.. 5 0 0
250,520	,,	,,	4½		B. 3½ p.c.	85—90	.. 5 0 0
80,100	,,	Dec. 13	4		4 p.c. Deb.	109—114	.. 3 10 2
182,380	10	Jan. 16	5	Tuscan, Ltd.		8—9	.. 5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		97—102	.. 4 18 0
230,000	5	Feb. 28	9	West Ham, 10 p.c.		9—10	.. 4 10 0
147,000	10	,,	6	Do. 7 p.c.		11½—12½	.. 4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb.		105—110	.. 3 12 9
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord.		290—295	−2 3 14 7
150,000	,,	,,	5	Do. 5 p.c. Pref.		155—160	.. 3 2 6
160,000	,,	,,	$4\frac{1}{2}$	Do. 4½ p.c. Pref. '75		138—143	.. 3 2 11
175,785	,,	Mar. 28	$4\frac{1}{2}$	Do. 4½ p.c. Deb.		140—145	.. 3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord.		188—193	.. 3 12 6
654,740	,,	June 14	$4\frac{1}{2}$	Do. 4½ p.c. Deb.		143—148*	.. 3 0 10
980,169	,,	,,	3	Do. 3 p.c. Deb.		94—96*	.. 3 2 6
700,000	50	June 14	8	Grand Junction	10 p.c. max.	103—106*	.. 3 15 6
310,000	Stk.	Mar. 28	4		4 p.c. Deb.	123—127	.. 3 3 0
708,000	Stk.	Feb. 14	14	Kent		285—295	−5½ 4 14 11
160,000	,,	,,	7	Do. New, 7 p.c. max.		200—205	.. 3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max.		270—280	.. 3 15 0
406,200	100	,,	8	Do. 7½ p.c. max.		207—212	.. 3 15 5
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb.		123—126	.. 3 3 6
500,000	100	Feb. 14	$13\frac{3}{4}$	New River, New Shares		403—408	−2 3 7 5
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb.		127—132*	+2 3 0 7
902,300	Stk.	June 14	6	South-wark	Ord.	170—175*	−7 3 8 7
126,560	100	,,	6		7½ p.c. max.	162—167*	−5 3 11 19
489,200	Stk.	,,	5	and	5 p.c. Pref.	150—155*	.. 3 4 6
1,019,585	,,	Apl. 12	4	Vauxhall	4 p.c. A Deb.	125—130*	.. 3 1 7
1,155,066	Stk.	June 14	10	West Middlesex		260—265*	.. 3 15 6
200,000	,,	,,	$4\frac{1}{2}$	Do. 4½ p.c. Deb.		138—143*	.. 3 2 11
200,000	,,	Mar. 14	3	Do. 3 p.c. Deb.		95—98	.. 3 1 3

*Ex. div.

to reach the Members of Parliament; and he hoped that in course of time the truth might prevail, as he had no doubt it would. He then moved the adoption of the report and accounts.

The Right Hon. Viscount KNUTSFORD seconded the motion, which, after a short discussion, was carried unanimously.

Resolutions were subsequently passed declaring the dividends recommended, re-electing the retiring Directors, appointing Mr. Goulding, M.P., a member of the Board, to fill the vacancy caused by the resignation of Mr. Noel Whiting, and re-electing the retiring Auditor (Mr. C. P. Crookenden).

Mr. REMNANT, M.P., afterwards proposed a vote of thanks to the Chairman and Directors. The shareholders, he remarked, greatly appreciated the manner in which the Board were fighting to protect the Company's interests; and he thought that they might look forward very hopefully.

The motion was seconded, and unanimously carried.

The CHAIRMAN, in acknowledging the compliment, expressed a hope that at the meeting next December the Directors might be able to present better figures.

The proceedings then terminated.

THE RATING OF RESERVOIRS.

Public Meeting at Sunbury.

The first of a series of meetings which it is intended to hold under the auspices of the Association for Promoting the Equitable Rating of Reservoirs recently took place at Sunbury. There was a large gathering; and among those present were representatives from Sunbury, Hampton, East Molesey, Walton and Hersham, Littleton, and Staines. Mr. T. CROYSDALE presided.

The CHAIRMAN said the question of the rating of reservoirs was a very old one; and, curiously enough, in the enactments passed by different Governments for various ratings the word "reservoir" was never mentioned. Land, buildings, canals, and railways were named; and although "reservoirs" never occurred, there was mentioned the phrase "land covered with water." From this expression a great deal of uncertainty had arisen with regard to the rating of reservoirs; and the Water Companies had taken advantage of it to claim to be assessed for their reservoirs at only one-fourth, and had succeeded. There had been three cases in the Courts, promoted by local authorities, to establish, if they could, the fact that reservoirs were not in the ordinary sense land covered with water. The real meaning of land covered with water was, of course, a lake or pond; and when these words were put into enactments such reservoirs as those which now surrounded them did not exist. The cases to which he referred were those of Birmingham, Leyton, and Hampton; and in each judgment was given in favour of the water company. He would particularly refer to the last of these three cases—viz., that against the Urban District Council of Hampton. He wished to congratulate that body upon their having taken the case through the various Courts to the House of Lords. They lost; but he thought they would ultimately find that, although they were out of pocket by some £2000 or £3000 on the case, it would in the end come back to them. The result of the judgment was really the commencement of the present agitation. A conference was held in London by the different local authorities; and the Association for Promoting the Equitable Rating of Reservoirs was formed. In Sunbury, if all the reservoirs paid the full district rate, instead of one-fourth, they would pay £700 per annum more than they did now, which was equal to a 4d. rate. Hampton would benefit, if the reservoirs were fully rated, to the extent of £1700. Was it fair to say of these reservoirs at Hampton, as the House of Lords had said by their decision, that they were "land covered with water," when several of them were brick-lined? The reservoir at Stanwell, with its aqueduct to Sunbury, cost £1,000,000, and was raised from 40 feet to 50 feet above the level of the ground. If rated on the basis of 4 per cent. on the outlay, it would be rated on £40,000; and 6s. in the pound on £40,000 would be £12,000. But as the law at present stood, they would pay only £3000. Could anyone reasonably describe the aqueduct running from the Company's reservoirs into Sunbury as land covered with water? That was an instance of what he considered inequality and unfairness. But they were only at the beginning of the erection of these reservoirs, although there were so many already existing. The last Metropolitan Water Commission had reported that in the course of the next twenty or thirty years there would have to be reservoirs constructed in the Thames and Lea Valleys covering 6000 square acres, or about 10 square miles; so that although they suffered now, they could easily see that the inequality would be still more oppressive in the future, unless the law of rating were altered. There was another point also to be taken into consideration. Where reservoirs were erected, the surrounding land was depreciated in value. Nobody would build a house that would be overshadowed by reservoirs rising in front from 30 feet to 40 feet. They wanted to see the people of the Thames Valley at the back of this Association.

Mr. J. H. SCOTT, the Honorary Secretary of the Association, moved the first resolution, which was as follows: "That, whereas the House of Lords, sitting as a Court of Legal Appeal, and having before it a test case submitted by the Hampton-on-Thames Urban District Council, has decided that an artificial reservoir, constructed and used by a water company for the storage of water which it sells for profit, is merely land covered by water within the meaning of section 211 of the Public Health Act, 1875, and is therefore rateable to the general district rate in urban districts, and to the special expenses rate in rural districts, at only one-fourth of the full rateable value, it follows that such decision can now only be altered by Act of Parliament. In other words, it is now the settled law of this land that, simply because those huge, massive structures called reservoirs happen to store water, the owners thereof can legally claim to pay only one-quarter of the amount they would have to pay in rates if the very same structures stored food or fuel or

CARBURETTED WATER-GAS APPARATUS

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W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

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any other business commodity. Such a state of law this meeting pronounces to be glaringly anomalous, manifestly unjust, and clearly entitled to amendment. That being so, this meeting also records its satisfaction at the establishment of the Association for Promoting the Equitable Rating of Reservoirs, and expresses the conviction that all concerned in the welfare of Sunbury should uphold the Association in the organized campaign which, beginning with Sunbury, it is inaugurating throughout the Thames and Lea Valleys. Further, as the Metropolitan Water Companies will no doubt be slow to realize the fact that much of the rapidly-growing volume of support which is gathering round this particular movement comes largely from quarters not unfriendly to their general interests, it is probable that for some time at any rate the Water Companies will pit their wealth and influence against this Association; and this meeting therefore recognizes that the Association's task will be an arduous one, and impossible of accomplishment unless it starts upon a sound financial basis, equal to the strain of a long, ubiquitous, and well-sustained propaganda throughout the constituencies generally—never missing any opportunity, especially such as bye-elections and general elections provide, for securing parliamentary support, and thus leaven the House of Commons, as a prelude to some well-considered use of such support for opportunely bringing effective influence to bear upon the Government itself. Therefore, this meeting recommends that, as rates cannot be used for this purpose, responsible and representative trustees should be appointed, and an appeal for adequate funds at once be started in Sunbury, confidently trusting that the response to such appeal will be worthy of the occasion, and calculated not only to encourage and strengthen the executive, but also to serve as an example and an inspiration in those other localities where similar meetings to this are being arranged by the Association."

Dr. HASLETT seconded the motion; remarking that he was in intense sympathy with it. The Association was formed with as righteous an object as any association had ever been founded to attain—viz., to put an end to one of the most iniquitous systems that ever prevailed in this country.

Mr. G. SANDERS, J.P., Chairman of the Hampton District Council, in support of the resolution, said that, as they had already heard, Hampton had had a good deal to do with this reservoir question; and it had very seriously affected their pockets. They were at the present time losing over £1700 per annum on the general district rate, which meant a 7d. rate on the parish. He had not the slightest doubt in his mind, from the context of the Public Health Act of 1875, that when the clause was inserted that land covered with water should pay only one-fourth, it was intended to apply to a lake or pond in a farmer's yard. But these reservoirs were large storehouses built up above the level of the surrounding country, and were not filled by gravitation, but by artificial means. The Companies argued that the bottom of their reservoirs was land covered with water. So it was; but it would be equally fair to argue that the whole country was land covered with water, which it was when it rained sufficiently. He hoped this question would take hold of the minds of the people not only round about their own neighbourhood, but all over the country, because it was impossible for any parish to tell how soon they would be attacked. Therefore the whole country should come forward to get an alteration of a law that had been twisted from its original purpose. The Chairman had told them that Hampton had incurred a certain amount of expense—in doing which he would like to say they were only acting upon what they conceived to be their duty. They had done what they could, but they did not mean to stop at that; and therefore he hoped they would all join with them in the endeavour to carry this question to a successful issue as soon as possible.

Mr. H. WILLMER, Assistant-Overseer of Sunbury, pointed out that the one-fourth assessment did not affect the poor-rate, but only the general district rate.

Mr. SCOTT said they were indebted to Mr. Willmer for making this announcement, because it was manifest that if the Companies must pay the full amount on the poor-rate, it was only just they should do the same on the general district rate.

The motion was then carried unanimously.

Mr. W. NEGUS, in the course of a discussion which followed, remarked that the Directors of the Water Companies were trustees for the shareholders, and that it was the law which was to blame in the first instance. He could not understand how these gentlemen could make any payment out of their funds which they were not compelled to do by Act of Parliament.

Mr. J. ROBERTS, Assistant-Overseer of Hampton, said the Water Companies were not satisfied with having got the decision in their favour as to reservoirs, but also applied it to filter-beds; and they felt there was nothing to do but to accept it. This was why they were losing £1753 per annum. But he would give the Southwark and Vauxhall Company their due. They had not asked for the disallowance on the old assessments, but only on the new ones, pending their being re-valued by a professional valuer (Mr. Cooke); and they compromised the matter with the Overseers by saying that they would not ask for the disallowance until such time as the new valuation came in. Then Hampton would feel it more than they did now.

The proceedings terminated with votes of thanks to the Chairman and Mr. Scott.

ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the Hartlepool Corporation have, it is understood, decided to recommend the Council to establish electric lighting works at an estimated cost of £18,000.

The Teignmouth District Council have decided to proceed no further in the matter of electric lighting. The only step which has been taken was the obtaining of a Provisional Order two years ago. No attempt has been made to give effect to it; and, electric lighting having apparently lost some of the charm it once possessed for the Council, the matter is to be quietly allowed to drop.

The Cardiff Lighting Committee have decided to reduce the price of

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electric current for lighting purposes, at the same time giving consumers an alternative price to the maximum demand system, which is at present adopted. On the latter principle, the price will be 7d. per unit for the first hour, and 2d. per unit afterwards; but consumers may, if they prefer, take the current on the all-round price of 4½d. per unit. The price of energy for power purposes is 4d. per unit for the first hour, and 1d. per unit afterwards.

The working of the electric light undertaking of the Carlisle Corporation in the past financial year—the second of its existence—has resulted in a large deficiency; the net loss having amounted to £1665, a sum equal to a rate of 2d. in the pound. Tradesmen and the general public are proving chary in adopting the new system of lighting; and had not an extra supply of 176,699 units been taken by the Tramways Company for running their cars, the net loss would have proved still greater than is shown by the above figures.

The Electric Lighting Committee of the Yarmouth Corporation have had before them the accounts of the past year's working. The income was £7225, and the working expenses were £5406; leaving £1819 to pay interest and sinking fund. As these, with other small items, amount to £2570, there is a deficiency of £751. This sum will not fall upon the rates, as there was a balance last year of £371, and a sum of £380 will be carried forward to next year's account. The loss on the year's work has been caused by the high price of coals, which made the production more costly by about £650, and the reduction in price to customers (made before coals went up) amounted to £900.

A special meeting of the members of the West Bromwich Tradesmen's Association was held last Tuesday for the purpose of considering the electric lighting question, and of eliciting further information for the benefit of the tradesmen of the borough. Mr. A. G. Turley presided over a large attendance. After a rather heated debate, the following resolution was passed: "That, in the opinion of the Association, the Electric Lighting Committee has not carried out its compact to supply electric light to shopkeepers at a price equivalent to that of gas at 2s. 4d. per 1000 cubic feet. The Association considers the present charges for electric light will prove to be prohibitive to its general adoption by shopkeepers, and requests the Electric Lighting Committee to receive a deputation to represent the views of the Association."

The annual report of the Sunderland Corporation Electric Lighting Department states that the number of lamps connected on March 31 last was 50,092, and the number of units sold during the year was 1,218,768—an increase of 43 per cent. of lamps, and 90 per cent. of units on the previous twelve months. The year's profit on the station was £7254, or 7 per cent. on the average capital outlay for the year. The sinking fund and interest came to £5997; leaving a net balance of £1257 to the credit of the department. The enormous rise in the price of coal represented an increased cost to the station of £2315. The total cost per unit was 3d., and the average revenue 3·25d. per unit. Compared with the other stations, Sunderland stood fourth on the list of 118 stations for charges to consumers. Cork comes first with a charge of 2·52d. per unit; Nottingham second, with a charge of 2·87d.; and Manchester third, with 3·24d.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Perth Corporation gas undertaking have been issued. They show a revenue of £33,660, made up as follows: Gas sold, £27,596, of which £3172 was derived from prepayment meters; tar, £126; coke, £2801; and other residuals, £2643. The expenditure included: Coal, £17,256; lime, £377; wages, £3985; salaries, £951; meters and furnishings, £447; mains and service pipes, £319; miscellaneous repairs and charges, £292; and feu-duty and taxes, £1145. Annuities payable come to £2702, interest required to £2425, and sinking fund for repayment of borrowed money and the redemption of annuities to £2250. Contingency and depreciation funds absorb £500. There is a deficit of £670 on the year's working. Notwithstanding this, it is anticipated that the price of gas will be reduced from 3s. 6d. to 3s. 4d. per 1000 cubic feet. It is not surprising, considering the very large outlays connected with the removal of the gas-works, that there should have been a balance on the wrong side the first year—especially with coal at famine prices. But the fact that, in face of a deficit, the charge for gas is to be reduced, is all the more gratifying. Already the new works are beginning to pay.

The Perth Town Council spent nearly two hours on Monday discussing the proposals which were made last year, and which were referred to the whole Council in Committee, with reference to the supply of gas fires and cookers. Mr. Watson, the Convener, explained that they had been working on a simple hire system, which gave them a return of 7 per cent., and that by the new method of hire-purchase the return would be 10 per cent. In the course of the discussion, the personal element came up more than once; those who were responsible for the system hitherto in use being naturally unwilling to see it superseded. The new plan was, however, adopted by 19 votes to 6.

It was reported to the Council that, in connection with the proposal of the Bridge of Earn Gas Company to take the gas they require from the new Perth Gas-Works, the Town Clerk of Perth has been instructed to write to Sir R. D. Moncreiffe, Bart., as representing the Company, that the Council are prepared to give the supply at the same price as is paid by consumers in Perth, subject to a deduction of 5 per cent. on the account if a certain quanity of gas be taken. The Company are to be at the expense of laying a main from the existing boundary of the city gas supply. A reply to the Town Clerk's letter has not yet been received.

The report of Mr. A. Bell, jun., to the Peebles Gas Commissioners this week was to the effect that the increase in the consumption of gas during the month was at the rate of 25·3 per cent. over the corresponding month of last year. The Gas Committee recommended that the price of gas be reduced from 4s. 2d. to 3s. 9d. per 1000 cubic feet to ordinary consumers, and to 3s. 4d. for consumption by gas-engines. Provost Ballantyne said it was stated last year that if they could continue to supply gas at 4s. 2d., considering the price of coal, it would be

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very satisfactory. They had done this, and had a balance, he understood, of about £70 after having wiped off £50 of bad debts and set aside £228 to a sinking fund. A year ago they resolved to write off a little more than 5 per cent. for depreciation; but the income-tax assessor would not allow more than 5 per cent. Having considered the subject, the Committee saw no reason why present gas consumers should pay more than was necessary; and they recommended that the rate of depreciation be 5 per cent. In connection with the price of gas consumed through prepayment meters, which are set at 4s. 2d. per 1000 cubic feet, it had been resolved that out of every ten pennies found in the meters one should be returned. This makes the price 3s. 9d., the same as to ordinary consumers. The proposals of the Committee were adopted. In reply to a question, Mr. Williamson, the Treasurer, reported that the system of giving bonuses to the men according to the results of their working had operated very satisfactorily. The sum of £37 16s. 4d. had been paid—three men having got £8 14s. 9d. each, and two £5 15s. 11d. each. Mr. Williamson went on to say that "it seemed to be really a good way of paying men according to results; that the 'JOURNAL' last year condemned the scheme as impracticable and something mean, and an attempt to get work out of men without paying them for it; but that the men who had done the work were highly gratified." The Treasurer requires to be put right here. He is too imaginative. I was satisfied that my pen could not have spelt the word "mean" in connection with the conduct of the Peebles gas undertaking; and I have looked up what I wrote last year. There were two notices. In the first of them, on April 24, I remarked that I was not enamoured of the scheme, because it implied the existence of a belief that workmen did not do the best they could; and, further, that I thought experience in all ages had demonstrated that a suspected man did not do so well as one in whom confidence was placed. In the second notice, on May 29, I said: "It is very ingenious; but its foundation is not very stable. Not only will it create hostility among workmen, as a class, but if ever there should be an abnormal reduction in the output of gas, the scheme would go to pieces, because, while the men are in favour of receiving a lump sum at the end of the year, it is not to be expected of them that they would tolerate, not only a reduction of their stated wage, but also a demand for the refunding of their wages overpaid." Instead of saying it was an effort to get work out of men without paying them for it, what I said was: "It is now admitted to be a device for inducing the men to work harder at times. In other words, instead of the Commissioners being at the loss of half-a-man's wages, by paying whole wages when there is only half work, the loss is to be put upon the men, one set of whom, inside the works, are to be called upon to work harder in order to keep another set of men from being taken on." Instead of not paying, the men are to be paid more because they work hard; and the men who lose are those who are not taken on. I think I need not repeat my views upon the scheme, which is a fair-weather one, and has not yet been tested by adversity, until which time its merits cannot be proved.

In the same week as the Corporation of Perth have been resolving to expand the arrangements for carrying on the business of dealers in gas fires and cookers, the Corporation of Broughty Ferry have agreed upon a restrictive policy. Provost Gray, at the monthly meeting of the Town Council on Monday, moved a long resolution, the effect of which is to rescind a former resolution and to enact that in future charges shall be made for services, that the hire of apparatus be increased from 5 to 10 per cent., and that 10 per cent. be charged per annum for depreciation. Bailie Christie, the Convener of the Gas Committee, pleaded for inquiry, and pointed out that the actual sum which had been expended on the making of free connections had been only £237. In Provost Gray's opinion, the price of gas last year should have been 2s. 11d. instead of 2s. 6d. per 1000 cubic feet. That is a remark which, in the mouth of the Provost of a progressive place like Broughty Ferry, can only produce amazement. The question before the Town Council was whether they should expend money in the extension of the gas-works, so as to enable them to supply the rapidly-increasing demand for gas, or whether they should check the consumption by raising their charges. The Council resolved, by seven votes to five, upon the latter course. I do not know that I should be quite warranted in attributing this retrograde policy to the operation of the Town Councils Act, which came into force this year; but I have a suspicion that it is due to the working of that measure. Formerly there was a Gas Commissioner, who understood the business better than do a heterogeneous body like a Town Council. They have a short outlook, who act as has been done in Broughty Ferry.

I do not lose sight of the fact that the judgment of the Council may have been influenced by the imminence of electric lighting in the burgh. The Commissioners were driven by a speculative company into procuring a Provisional Order for the supply of electric lighting in Broughty Ferry. They have purchased a site for electric lighting works; and at this week's meeting of the Council, strong objection to the site was expressed. One section of the Council consider that the electric lighting works should be planted alongside the gas-works—I suppose in the mistaken belief that as the one increases the other will diminish—and another section (the larger of the two) think the electric lighting installation should be altogether independent of the gas undertaking. This is the sensible view; but, while a majority of the Town Council hold it, it is a pity that they should not see their way to giving the gas-works complete independence, and considering its requirements without reference to those of the electric light department.

The Meigle Gas Company have paid a dividend at the rate of 2½ per cent. The Leven Gas Company have paid a dividend of 5 per cent., and voted a retiring allowance to Mr. R. Readdie, who has resigned the managership of the Company after 27½ years' service. The report of the Directors of the Kinross and Milnathort Gaslight Company, Limited, for the past year, states that there was a marked increase in the quantity of gas consumed during the year, but that they had to contend with an unprecedented rise in the price of coal, amounting to 4s. 6¾d. per ton. They were able, however, to pay a dividend of 5 per cent. The Blairgowrie Gas Company have reduced the price of gas by 6d. per 1000 cubic feet. The Inverurie Gas Company have paid a dividend of 7½ per cent.

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The accounts of the Dundee Corporation Water Department for the past year were laid before the Town Council on Thursday. Treasurer Ritchie said they began the year with a balance of £1237; reduced the domestic rate by 1d., thus giving the public the benefit of a reduction of about £1700; and, finally, in place of an estimated surplus of £187, ended the year with a deficiency of £186. It was curious, though, of course, merely accidental, that the figures representing the deficiency should approximate so closely to those of the anticipated surplus. What was the cause of the deficiency? It was not in the expenditure; for while the estimated expenditure was £49,535, the actual has turned out to be £49,350, or £185 less than the estimate. The reason lay in the fact that the revenue had not come up to their expectations. Inclusive of the surplus, they anticipated a revenue of £49,722. The actual had, however, proved to be only £49,163; being a shortage of £559. This was wholly due to the special rates, for the domestic and public rates were better than the estimate by close on £80. At present the debt was being steadily reduced, as the payments into the sinking fund outbalanced the annual capital expenditure. Their debt reached high water-mark in the year 1894-5, when it stood—apart from the capitalized value of the annuities—at £530,964. This year it stood at £506,842, so that there had been an absolute reduction during six years, beyond the capital expenditure, of £24,000. The report was adopted. It is expected that there will be no variation in the domestic water-rate, which at present is 9d. per pound.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 15.

Sulphate of Ammonia.—The tone of the market in Scotland has recovered somewhat from the depression of the early part of the week; but elsewhere prices have barely been maintained. The closing quotations are £10 7s. 6d. per ton f.o.b. Hull, £10 10s. f.o.b. Leith, and £10 12s. 6d. to £10 13s. 9d. per ton f.o.b. Liverpool. There has been fair direct inquiry; but offers have been mostly at a decline on current prices, and only a moderate business has been done. Covering of contracts for June delivery has for the most part been postponed; but, supplies being limited, there has not been any serious shrinkage in values. In the forward position, Scotch makers are firm at £11, ordinary terms, while London, Beckton terms, is quoted £10 15s. per ton. There is, however, speculative offering at £10 15s., ordinary terms, at the different ports; but even this discount has not largely attracted buyers, who are seeking to get in at, or below, prompt prices.

Nitrate of Soda is quieter in the forward position; but on spot the quotations remain at 8s. 7½d. and 8s. 10½d. per cwt. for ordinary and refined qualities respectively.

LONDON, *June* 15.

Tar Products.—The markets are in about the same position, with the exception of crude carbolic, which is decidedly weaker. The quantities of German crystals which are being offered are having an effect on crude; and consumers are no longer buyers at 2s. 5d. for early delivery. As a rule, they offer only 2s. 4d. to 2s. 4½d.; but it remains to be seen whether distillers are prepared to meet the position or to wait a little longer, so that more definite particulars may be learnt as to the production of German crystals. Tar oils continue in good demand; but prices have not shown any improvement during the last few days. Solvent remains quiet. The absence of demand for export has a serious effect on the value of this article. Anthracene remains in precisely the same position. It is evident that the production is being discontinued by nearly all the country makers; and this may have an effect on "B" qualities in the future, although stocks are at present too heavy to admit of any immediate improvement. Creosote salts are in rather better demand; several consumers showing a disposition to purchase if makers here will meet them as regards price. The position of pitch is unaltered; but the Continental demand is certainly not so strong as was the case a little while ago, especially for forward delivery. The London market, however, is in a very healthy state; none of the large producers having any quantity to sell for October-December, and at present it is too soon to speak of business for further forward.

The average values obtaining during the week are: Tar, 14s. 6d. to 17s. 6d. Pitch, east coast, 29s. 6d.; west coast, 27s. 6d. Benzol, 90's, 8¾d. to 10d.; 50's, 8d. to 10d. Toluol, 11d. Crude naphtha, 4d. Solvent naphtha, 1s. Heavy naphtha, 11d. Creosote, 1¼d. Heavy oils, 2¾d. Carbolic acid, 60's, 2s. 4d. to 2s. 4½d. Naphthalene, 70s. to 80s.; salts, 40s. to 50s. Anthracene, "A," 2½d.

Sulphate of Ammonia.—The downward movement has continued during the past week, and there has been an absence of business. The Gaslight and Coke Company reduced their price to £10 15s.; but there are sellers on Beckton terms at £10 10s. A little business has been reported at Hull, but only at low prices. There are now sellers at £10 7s. 6d.; but buyers offer only £10 5s. In Leith, sales are reported at £10 7s. 6d.; and although makers now ask £10 10s., consumers are not disposed to purchase at this price. As regards Liverpool, the demand for shipment from this port is not so strong; but prices are fairly well maintained in comparison with those ruling at other ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Gas-coal prices are now settling down to something like the season's basis. Although, as anticipated in previous reports, 2s. 6d. per ton off last year's contract rates has not been rigidly adhered to as the maximum concession in all cases, any reduction beyond this has not been at all general; and for the most part special conditions have entered into consideration in fixing the contract prices. A fairly large weight of business has now been put through; and the general average prices at the pit may be quoted at 10s. to 10s. 6d. per ton for the lower qualities, 10s. 9d. for medium sorts, and 11s. to 11s. 3d. for best screened Wigan gas coals. It does not now seem likely that there will be any material change on these figures;

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representatives of collieries reporting that they have no difficulty in settling contracts on the above basis. The conditions with respect to the locomotive fuel contracts are, however, not so satisfactory to the coalowners. Although they have come down 4s. per ton on the prices they were able to secure last year, the railway companies are evidently not at all anxious about concluding their contracts; and, in any case, it is currently reported they are not buying in such large quantities as usual. One or two special contracts have been secured at about 9s. 3d. per ton at the pit, but 9s. is the figure coalowners are prepared to accept for the more important contracts, and on this basis they are now waiting for some definite intimation from the railway companies. Other descriptions of round coal are moving off only moderately; and with stocks accumulating, pits are gradually getting on to short time—four to five days per week being now the average. House-fire coal is steady at the reduced rates; but fuel is offering at lower figures from other districts. Common round coals for steam and forge purposes are meeting with a very keen competition; and extremely low prices are being quoted to clear off surplus quantities for shipment. At the pit, 10s. to 10s. 6d. per ton are full average prices for Lancashire steam and forge coals, with similar qualities obtainable from other districts at from 8s. to 8s. 6d. For shipment, as low as 11s. 3d. to 11s. 6d. is being taken for delivery at the ports on the Mersey or the Manchester Ship Canal, with 6d. to 9d. above these figures quoted for some special qualities. Engine fuel is perhaps not quite so much a drug on the market, supplies of better qualities being scarcely so plentiful; but this is due not so much to increased demand as lessened production. For best Lancashire slack, prices are steady at about 8s. to 8s. 6d. per ton at the pit; but for inferior descriptions all sorts of prices are ruling—ranging from 3s. 6d. and 4s. for slack coming from outside districts, to 6s. 6d. and 7s. for common slack at Lancashire collieries. The slightly improved position in the coke trade is being well maintained; and with an advance in common Yorkshire cokes, local makers are able to hold firmly to their prices. At the pit, good washed Lancashire furnace cokes average 12s. 6d. to 13s. per ton, with foundry qualities ranging from 23s. and 24s. to 25s. and 26s. per ton at the ovens.

Northern Coal Trade.—There is an increased demand this week, though it is in part due to exceptional circumstances. Coal is being sent very freely forward on contracts, because the rebate is still allowed. There is also a desire to get fuel away before the great local holiday of next week. Thus best steam coals are firm, Northumbrians being 13s. per ton f.o.b., while steam smalls are from 5s. to 5s. 6d. The latter are in rather less demand, though the collieries are still fully employed. Gas coals have been in larger request for export; and where early delivery could be given, the prices are firm and slightly higher—from 10s. to 10s. 6d. per ton f.o.b. being quoted. For sales for more forward delivery, the price is rather lower; and the contracts that are now being booked for delivery months ahead are generally on the basis of about 9s. per ton f.o.b. The gas coal trade may be generally said to be very brisk. Coke is rather firmer; best Durham sorts being from 17s. 9d. to 18s. 6d. per ton f.o.b. The price of blast-furnace coke is from 15s. to 15s. 6d. per ton at the furnaces. This improvement has, in a measure, steadied the gas coke trade, the output of which is now rather low. The quotation on the Newcastle Exchange is still from 12s. to 13s. per ton f.o.b. for gas coke.

Scotch Coal Trade.—There is as yet no change to record. The market is evidently waiting for the settlement of the great locomotive contracts in England, which are now due. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 10s. 3d. to 10s. 6d. The shipments for the week amounted to 202,160 tons—a decrease of 6040 tons upon the previous week, and of 4875 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,961,641 tons—a decrease of 572,945 tons upon the same period of the previous year.

Seaton Water Supply.—The Seaton Urban District Council have decided to apply to the Local Government Board for power to borrow £4000 for new water-works. The scheme adopted is one prepared by Messrs. Beesley, Son, and Nichols; the source of supply being Springhead, Axmouth. It is estimated that the daily yield will be 105,000 gallons; while the requirements of the town are about 90,000 gallons.

Additional Borrowing Powers for Stockport.—Colonel J. T. Marsh held an inquiry at Stockport last Thursday with reference to an application by the Corporation for sanction to borrow £28,590 for gas-works purposes and £5175 for electricity works. The money for the gas-works is required for stoves, meters, mains and services, purchase of a mill for the extension of the Heaton Lane works, and new condensers at Portwood. Nearly all the money for electric lighting was owing to overspending on the buildings and plant.

Winding up the North Bierley Gas Company.—After paying the shareholders of this Company on the terms agreed upon (after the purchase by the Bradford Corporation), there was a surplus of £2000. To consider the question for its disposal, a meeting of the Directors and shareholders has been held. A proposal was made that the money be handed over to the Directors as an honorarium for past services; but this was accorded little support. It was therefore agreed to divide the money equally among the shareholders.

Prospective Deficiencies on the Morecambe Gas and Electric Light Works.—In reviewing the estimates of the current financial year's expenditure, Mr. Willis informed the members of the Morecambe District Council last week that they had two new items to provide for; one being a deficiency in respect of the gas-works. The total cost had been £162,000. The purchase money was £141,000, an over-draft and stock brought it up to £148,000, and, in addition, there were certain mortgages and expenses connected with the purchase which brought the total up to £162,000. Mr. Duff estimated his profits for the year at £6392; but his liabilities would amount to £8522, so that there was a balance of £2130 to be provided for out of the rates, or an amount equal to a rate of 6d. in the pound! Then in regard to the electric light works, there was also a considerable deficiency to meet, amounting to £2178, which was equal to a 6d. rate!

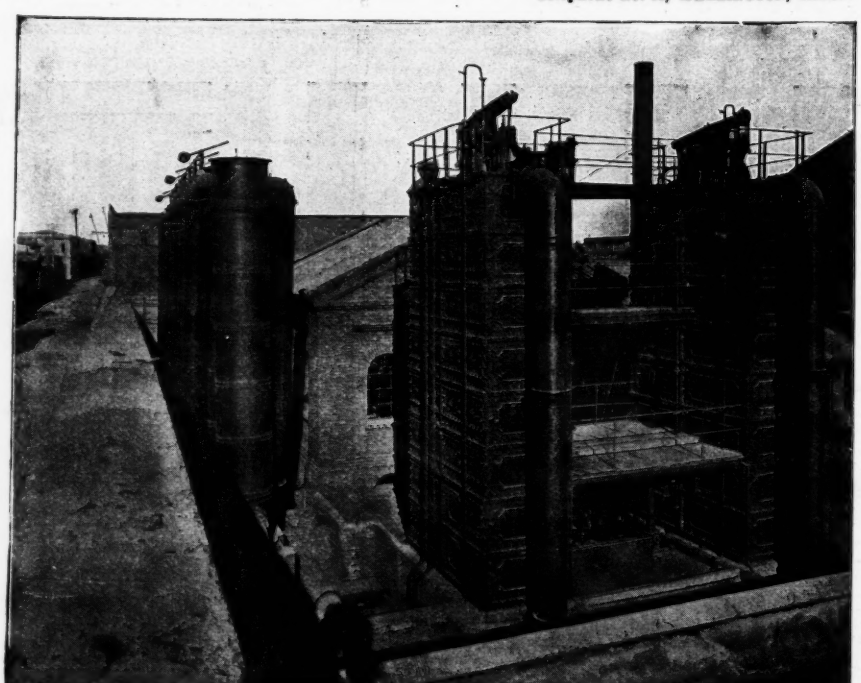
C. & W. WALKER, LTD.,

Midland Iron-Works, Donnington, nr. Newport, Shropshire.

110, CANNON STREET, LONDON, E.C.

Telegraphic Addresses: "FORTRESS, DONNINGTON, SALOP." "FORTRESS, LONDON."
Codes used A.B.C. and "A1."
Telephone No. 12, WELLINGTON, SALOP.

THE PURIFYING MACHINES REMOVE THE WHOLE OF THE AMMONIA AND TAR FROM THE CRUDE GAS TOGETHER WITH UPWARDS OF 50% OF THE CO_2 AND H_2S.



THE ANNULAR CONDENSER FITTED WITH WATER COOLING ARRANGEMENT COOLS DOWN THE GAS TO THE WATER TEMPERATURE IN THIS HOT CLIMATE.

WALKER'S PATENT CONDENSER AND PURIFYING-MACHINE AT SANTIAGO GAS-WORKS.

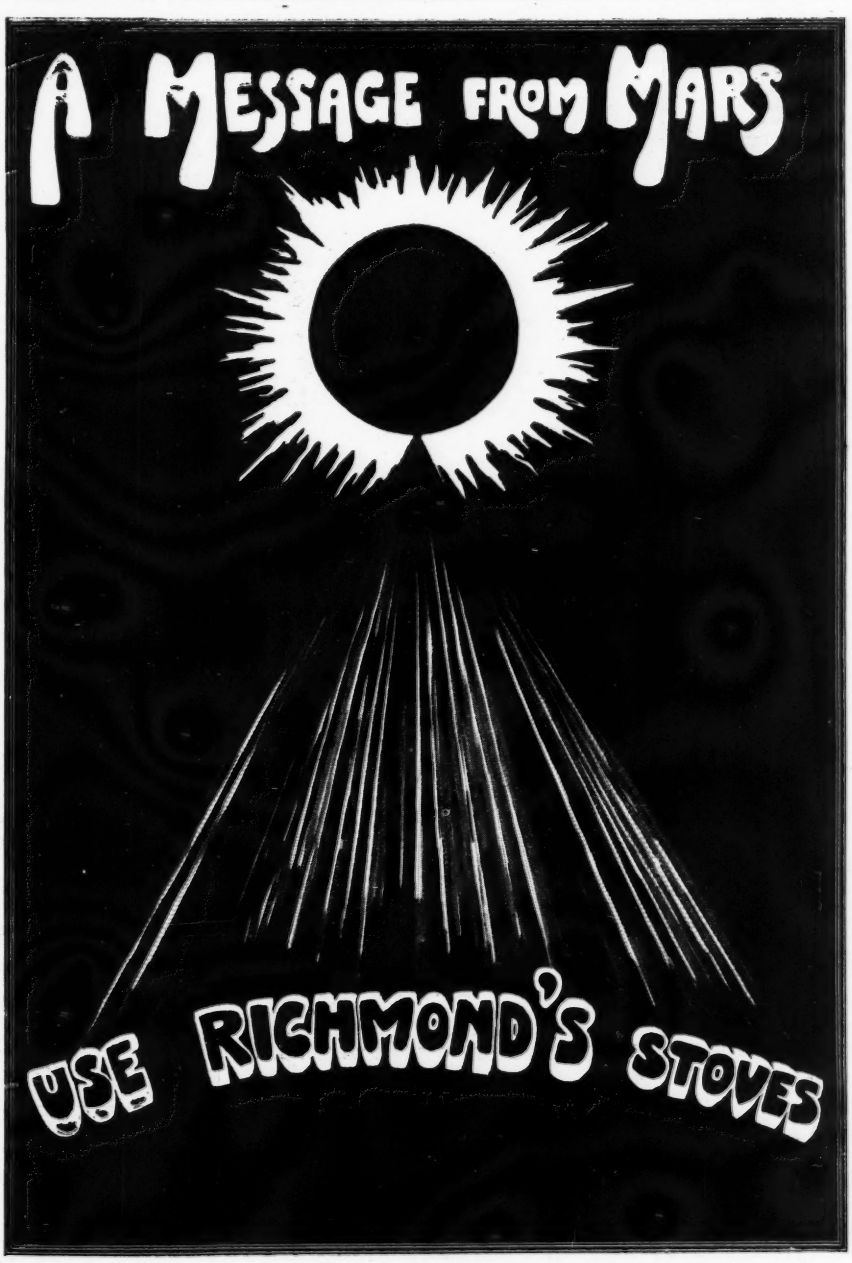
Cork Gas-Workers' Strike.—We learn from the "Cork Examiner" for Saturday last that the labour staff at the gas-works was augmented on the preceding day by 15 new hands, most of whom came from the counties of Cork and Waterford. There are upon the books 75 night hands and about 40 day hands.

The Electrolysis Question.—Last Thursday week an inquiry was held at the Board of Trade in regard to the Llanelly and Mynydd Mawr Light Railway Bill, upon which the Board have to report to Parliament. The Llanelly Gas Company are appearing in opposition; and they were represented at the inquiry by Mr. Cooper (of Messrs. R. W. Cooper and Sons) and Mr. A. R. Cawley, the Engineer and Secretary. They were successful in their request that the Board should withhold their consent to the Bill, pending the decision of the House of Lords Committee, to whom the Bexley and London County Council Tramways Bills will be referred.

Chester Gas Workers' Profit-Sharing and Pension Schemes.—In the "JOURNAL" for the 4th inst., we indicated the nature of the profit-sharing and pension schemes which the Chairman of the Chester Gas Company (Mr. J. Gamon) submitted to the employees at a meeting held on the 24th ult. The object of the Directors in formulating the schemes is a highly commendable one—namely, the encouragement of thrift on the part of their employees. There was evidence, on the occasion referred to, of appreciation by the latter of the efforts made on their behalf; and consequently we are not surprised to learn that a very general desire is manifested to accept the Directors' offer. The men evidently see where their real interest lies. It is not intended, as has been supposed, to divide the whole of the bonus yearly; one-half is to be retained by trustees of the employees, to accumulate for the benefit of the profit-sharer. The trustees may leave this half bonus in the hands of the Company at 4 per cent. per annum, or invest it in the Company's ordinary or other stocks or in trustee securities. Every facility will be given for a profit-sharer to invest his accumulations of bonus in this way, in minimum quantities of £10 of stock.

Bradford Corporation and the Shipley Improvement Bill.—As the result of a conference between deputations from the Shipley District Council and the Bradford City Council, the latter authority have decided to withdraw their opposition to the Shipley Improvement Bill. Bradford's intended opposition to the Bill chiefly rested upon the gas clauses; but these have been amended so as to satisfy the Corporation. The promoters have thus disposed of what was expected to be the greatest opposition to the Bill.

Opposition to the Mond Gas Bill.—A meeting of the Walsall Town Council took place on Monday last week, when the General Purposes Committee submitted a long report from the Parliamentary Sub-Committee with regard to the opposition to the Mond Gas Bill. The Sub-Committee stated that, even admitting Mond gas to be as good a producer gas as the promoters contended it was, there was no probability of there being any general demand for it in Walsall, having regard to the character of the local trades and the quantity in, and the price at, which the promoters proposed to supply it. Should the Bill become law, it would practically confer on the promoters a monopoly in the supply of every kind of producer gas for all time, to the disadvantage of manufacturers who were likely to make use of it. The Corporation could, it was thought, manufacture and supply a producer gas, if there was sufficient demand for it, on more economical terms than any company who might have to convey it a considerable distance before distributing it. Having regard to the future prosperity of the trades of the borough, to the fact that the ratepayers, as owners of the gas and electric lighting undertaking, had £400,000 at stake, and that the Bill aimed a serious blow at the principle of municipal control, the Sub-Committee unanimously recommended that the opposition be continued in the House of Lords. The General Purposes Committee had adopted this report; and, on their recommendation, the Council unanimously decided to lodge a petition against the Bill. The West Bromwich Corporation have also decided to petition the House of Lords against the Bill, as there are several clauses which will require alteration.



John Wright and Eagle Range, Limited, have lately been holding exhibitions of their gas cooking and heating stoves and other labour-saving appliances, with cookery demonstrations by lady experts, at Bedminster, Bristol, Darwen, Wigan, Workington, Prestatyn, and Brixton.

We learn that orders for purifiers (Green's type) have been placed with Messrs. Clapham Bros., Limited, of Keighley, by the Driffield and Hunstanton Urban District Councils, and by the Altrincham Gas Company; all the covers to be fitted with the firm's patent "Eclipse" joint.

A Company has lately been registered in Edinburgh with a capital of £110,000, in £10 shares, to acquire the undertaking of Messrs. R. Laidlaw and Son, and to carry on the business of gas and water engineers and contractors, and manufacturers of cast-iron pipes, gas and water meters and valves, and electric, gas, and water fittings.

A meeting of the Windsor Street Gas-Works subscribers to the Birmingham Saturday Hospital Fund was held last Friday, with Mr. Charles Hunt in the chair. The report of the Workmen's Committee showed that during the past twelve months the contributions had amounted to £118 11s. 2d.; being the largest amount collected on the works in any one year.

Messrs. R. & A. Main, Limited, have been showing their enamelled gas-cooker in the Billiard-Rooms Hall, Grove Road, Rock Ferry, Birkenhead; and its capabilities have been demonstrated twice daily by Miss Parker.

Messrs. Joseph Taylor and Co., of Bolton, have in hand one of their latest makes of saturators, with double detachable ammonia pipes, detachable acid pipe arrangement, lead lips for timber lagging, &c., and sulphate drainer, for the Stratford-on-Avon Corporation Gas Department; also plate lead saturators, with detachable ammonia and acid pipes, &c., for the Cleator Moor Gas Department, and the Bideford Gas and Coke Company, Limited.

The Clyde Shipbuilding and Engineering Company, Limited, of Port-Glasgow, have just launched a steel lightship for the Northern Lighthouse Commissioners, for whom Messrs. D. & C. Stevenson, of Edinburgh, are the Engineers. Messrs. Pintsch, by whom, in conjunction with Messrs. Stevenson and Co., builders, the design has been elaborated, have fitted up the ship with their compound gas system, in order to do away with the necessity for the maintenance of a crew on board, as the vessel is to be stationed on the West Coast of Scotland, at the Otter Rock, near Islay, where it will be subjected to great stress of weather.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

TERMS OF SUBSCRIPTION to the "JOURNAL."

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

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Telegraphic Address: "GASKING, LONDON."
Telephone Number: Holborn 121.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., Central Plumbing Works, Victoria Square, BOLTON.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
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AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

R. B. FITZ-MAURICE, 4, East India Avenue, London. Foreign and Colonial SHIPMENTS and CHARTERING promptly attended to FIRE, LIFE, and ALL CLASSES of INSURANCES effected on the Lowest Terms.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.

Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS CYCLES at Reasonable and LOW PRICES. Guaranteed and sent on approval. For Cash or Gradual Payments. Catalogue post free. Old Machines Exchanged or Repaired.

MELROSE CYCLE COMPANY, COVENTRY.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Have- lock Road, Saltley, Birmingham.

Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

TO THE CHAIRMEN AND DIRECTORS OF GAS COMPANIES,

WHOSE ASSESSMENTS HAVE BEEN UNJUSTLY INCREASED, OR ARE ALREADY TOO HIGH.

AN experienced and successful Rating SURVEYOR will be happy to render assistance to Companies in these positions.

Address No. 3707, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, One or Two Good Gas- FITTERS, used to routine of Gas-Works Business. Permanent Jobs.

Apply to Mr. G. STEVENSON, Gas-Works, LONG EATON.

QUAKER'S YARD GAS AND WATER COMPANY, LIMITED.

THE Directors of the above Company are open to engage a MANAGER and SECRETARY for their Gas-Works. He must be able to keep the Accounts in the form prescribed by Parliament, and capable of managing the Works in most approved manner. The make of Gas last Year was 8,750,000 cubic feet. The Works are modern, and in a growing District. House, Coal, and Gas found.

Applicants must state Age, Salary required, and full Particulars of previous Situations.

Three Testimonials only will be entertained.

Address, WM. WATKIN LEIGH, Esq., J.P., Glyn Bargoed House, TREHARRIS.

June 6, 1901.

OXIDE OF IRON OF FINEST QUALITY.

BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.

Send for full Particulars to
BALE & CO., 120 & 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

WANTED, for Permanency, a Steady Young Married Man, Cyclist, Active, to reside at Service Reservoir in Company's house, and act as TURNCOCK, PLUMBER, and SERVICE LAYER.

Apply, stating Age, Wage, and Experience, to the MANAGER, Water-Works, Mistley, ESSEX.

MECHANIC and Blacksmith wanted, willing to make himself generally useful on the Works. Applicants must have had experience in an Engineer's Workshop.

State previous Employment, Age, Wages required, and enclosing *copies* of Testimonials, to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

AUSTRALIA (N.S.W.).

RESIDENT Engineer required (under Chief) for Manufacture, Distribution, &c. Age about 30 to 32. Must have had some experience in Water Gas, Control of fairly large Works, and management of Inclined Retorts. Liberal Salary. Residence and First-Class Passage to suitable Applicant.

Address, with full Particulars, No. 3705, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CLACTON URBAN DISTRICT COUNCIL.

COLLECTOR OF GAS AND WATER RATES, &c.

THE above Council invite applications from suitable persons for the ABOVE OFFICE. Salary, £ 00 per annum.

Particulars of duties may be obtained upon application to the undersigned Clerk to the Council.

Applications, in candidate's own hand-writing, stating Age, Experience, Present Employment, and accompanied by *copies* of three recent Testimonials, to be sent to the undersigned not later than Tuesday, the 25th of June, endorsed "Collector."

Personal canvassing of Councillors is prohibited.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall, Clacton-on-Sea,
June 7, 1901.

WANTED, a Gas-Works on Lease or Purchase, by thoroughly practical Gas Engineer.

Address No. 3665, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STOKE-UPON-TRENT CORPORATION.

THE Gas Committee of the Stoke-upon- Trent Corporation desire to Purchase a STORAGE TANK for Tar or Liquor, of a capacity of not less than 25 tons, either New or Second-hand.

Quote Particulars to the undersigned.

WM. PRINCE,
Engineer and Manager.

FOR IMMEDIATE SALE.

OWING to the Introduction of Elec- tricity for the Public Lighting, the Sleaford Gas Company, Limited, have FOR SALE, 137 LAMP COLUMNS, BRACKETS, and COPPER LANTERNS. Many of the Lanterns are practically new, fitted with No. 4 Kern Burners, Auto-Taps, and Anti-Vibrators. Also One Large LAMP COLUMN, fitted with Arc Lamp and Three No. 4 Kern Burners, complete.

For Photos, Prices, &c., apply to H. WORTHURST, Engineer and Manager, Gas-Works, SLEAFORD.

WANTED, a few Tons of old Gasholder COUNTER-BALANCE WEIGHTS.
Address C. B. TULLY, Gas-Works, SLIGO.

FOR DISPOSAL—About 3 Tons of RETORT CARBON. Offers invited.
Apply to the MANAGER, Gas-Works, Chepstow, MON.

TO BE SOLD—
SINGLE GASHOLDER, 22 ft. by 10 ft. Four Columns
One PHOTOMETER by Sugg & Co., with 10-Candle Pentane Apparatus.
Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

FOR SALE—One Second-hand Gasholder in good condition, 40 ft. diameter by 14 ft. deep, with Five Cast-Iron Columns and Lattice Girders. This can be offered either erected in Brick Tank to be built to my Drawings, or supplied complete with Steel Tank and fixed ready for work.
For Price and Particulars, apply to
JOHN ANDREWS.
Gas-Works, Langley Mill.

ABERTILLERY URBAN DISTRICT COUNCIL
(GAS DEPARTMENT.)

OFFERS are required for Two Second-Hand PURIFIERS with Lids, and two Four-Way Valves complete.
Purifiers are 6 feet square, and 4 feet in depth. Two of the Plates have been chipped at the angles in removal.
JAS. M'BEAN,
Manager.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

SECOND-HAND Station Meters for SALE—
ONE RECTANGULAR STATION METER, 10,000 cubic feet per hour, 10-inch Connections, Two Valves and Water Lute, Clock and Tell-tale, with New Drum.
TWO ROUND STATION METERS, 8000 cubic feet per hour, 9-inch Connections, Two Valves and Water Lute, with New Drums.
ONE ROUND STATION METER, 4000 cubic feet per hour, 7-inch Connections, Two Valves and Water Lute, with New Drum.
ONE ROUND STATION METER, 4000 cubic feet per hour, 6-inch Connections, Three Screw-Down Valves.
TWO ROUND STATION METERS, 3600 cubic feet per hour, 6-inch Connections, Three Valves, one with Cradle, one with New Drum.
ONE ROUND STATION METER, 2400 cubic feet per hour, 4-inch Connections, Four-Way Cock Bye-Pass and Cradle, with New Drum.
Prices and further Particulars on application to JAMES MILNE & SON, LIMITED, Milton House Works, EDINBURGH; or Midland Meter Works, 48, Wellington Street, LEEDS

ABERTILLERY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS invited for the whole of the IRONWORK complete, including ASH-PANS and FURNACE DOORS and FRAMES, required for two Settings of Sixes 20 in. by 15 in. ⏀ (with Luted Lids in duplicate).
Detailed Specification and Net Cash Price, delivered f.o.r. Abertillery Station, to Mr. J. M'BEAN, Manager, Gas-Works, on or before the 25th inst.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.

THE Directors of the above Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR, produced at their Works during the Twelve Months ending the 30th of June, 1902.
Probable quantity of Tar . . . . . 1000 Tons.
" " Ammoniacal Liquor 1200 Tons.
Tenders for Liquor must state price per ton, per degree Twaddell's Hydrometer from 4° to 8°.
Tenders to be sent to the undersigned on or before Twelve o'clock noon, Tuesday, the 25th of June, 1901, marked "Tender for Tar" or "Liquor."
The Directors do not bind themselves to accept the highest or any Tender.
By order,
DAVID WOOD,
Secretary.
Offices: St. Mark's Street,
Hull, June 5, 1901.

THE Directors of the Sutton, South-coates, and Drypool Gas Company, Hull, invite TENDERS for the supply of 16,000 Tons of best SILKSTONE GAS COAL, stating price for each of the following descriptions: Screened, Unscreened, and Cobbles, for delivery during the Year ending the 30th of June, 1902, in North-Eastern Railway Company's Waggons into this Company's Siding, Dansom Lane, Hull.
The lowest or any Tender will not necessarily be accepted.
Tenders to be sent addressed to the undersigned before Twelve o'clock noon on Tuesday, the 25th of June, 1901, marked "Tender for Coal."
By order,
DAVID WOOD,
Secretary.
Offices: St. Mark's Street,
Hull, June 5, 1901.

ILKLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of RETORTS and FIRE-BRICKS, particulars of which may be had by application at the Offices, Leeds Road, Ilkley.
Tenders, addressed to the Chairman, and endorsed "Tender for Retorts," must be delivered not later than Thursday, the 27th day of June, 1901.
The lowest or any Tender not necessarily accepted.
WM. EVERITT,
Manager.

ILKLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of 8000 Tons of best screened GAS COAL, to be delivered at Ilkley Station, during the next Twelve Months ending July 31, 1902, in such quantities monthly as may be required.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Coal," must be delivered not later than Thursday, the 27th day of June, 1901.
The lowest or any Tender not necessarily accepted.
By order,
WM. EVERITT,
Manager.
N.B.—Tender Forms on application at the Gas Offices, Leeds Road, Ilkley.

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Com-pany are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, free on rail, G.N. Rly., or M. Rly., in Purchaser's Tanks, for One Year from the 1st day of July, 1901.
Terms: Cash Monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed Tenders are to be sent on or before the 25th inst., marked on the outside "Tender for Tar."
The Directors do not bind themselves to accept the highest or any Tender.
By order,
F. B. FOOTTIT,
Secretary.
Newark, June 8, 1901.

NEWARK GAS COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Works, for One Year from the 1st day of July, 1901, at per degree Twaddel (Temperature 60° Fahr.).
The Liquor to be not less than 5° in strength.
Terms: Cash Monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed Tenders, marked on the outside "Tender for Liquor," are to be sent on or before the 25th inst.
The highest Tender will not be necessarily accepted.
F. B. FOOTTIT,
Secretary.
Newark, June 8, 1901.

CHELTENHAM GASLIGHT AND COKE COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Cheltenham Gas-light and Coke Company invite TENDERS for the supply of COAL for a period of Twelve Months from the 1st of July next.
Particulars may be obtained from the undersigned, to whom Tenders, endorsed "Tender for Coal," must be delivered on or before Thursday, the 20th inst.
The lowest or any Tender will not necessarily be accepted.
R. O. PATERSON,
Engineer and General Manager.
Gas-Works, Cheltenham,
June 1, 1901.

BOROUGH OF RICHMOND, SURREY.
WATER-WORKS AND PUBLIC BATHS.

TENDERS FOR SMOKELESS WELSH STEAM COAL.

THE Town Council of the Borough of Richmond, Surrey, invite TENDERS for the supply of about 1500 Tons of best WELSH SMOKELESS STEAM COAL, to be delivered in Barges of about 40 Tons alongside the Wharf opposite the Water-Works, Richmond, for One Year from the 1st day of July, 1901, to the 30th day of June, 1902.
The Seam and District from which the Coal is to be supplied must be stated in the Tender.
Particulars and Forms of Tender can be obtained of Mr. W. G. Peirce, Borough Water-Works Engineer, at the Water-Works.
No Tender will be recognized unless it is made on the prescribed form, properly filled up in every respect, and no Expenses or Claim will be allowed or paid to any person whether tendering or not.
The Security stipulated by the Public Health Act, 1875, for the due performance of the Contract will be required. The Contract and Bond will be prepared by the Town Clerk.
Sealed Tenders, endorsed "Tender for Welsh Coal," and addressed to the Chairman of the Water Committee, Borough of Richmond, Surrey, must be delivered at the Town Clerk's Office by Ten o'clock, on Monday, the 24th of June, 1901.
The Council do not bind themselves to accept the lowest or any Tender.
FREDK. B SENIOR,
Town Clerk.
Town Clerk's Office, Town Hall,
Richmond, Surrey, June 5, 1901.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to re-ceive TENDERS for the supply of CANNEL and best screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of July, 1901.
The probable quantities required will be about 120 Tons of Cannel and about 1600 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites, and other objectionable matter; but the Council reserve the right of increasing or decreasing the quantities named.
The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating price per ton delivered alongside the Works, to be sent to the undersigned on or before the 20th day of June, 1901, and endorsed "Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied.
Further Particulars may be had on application to the Gas Manager, Mr. W. L. Donaldson.
W. MULLARD,
Clerk.
Council Offices, Lymm,
Cheshire, June 1, 1901.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to re-ceive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1901.
The Tar and Liquor will be delivered free into Contractor's boat on the Bridgewater Canal.
The Purchaser will have to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating Price per ton for Tar, and Price per ton for Liquor (5° Twaddel), to be sent to the undersigned on or before the 20th day of June, 1901, endorsed "Tar Tender."
The Council do not bind themselves to accept the highest or any Tender.
Further Particulars may be had on application to the Gas Manager, Mr. Donaldson.
W. MULLARD,
Clerk.
Council Offices, Lymm,
Cheshire, June 1, 1901.

COUNTY BOROUGH OF STOCKPORT.
(GAS AND ELECTRICITY DEPARTMENT)

TENDERS FOR STORES.

THE Gas and Electricity Committee are prepared to receive TENDERS for the supply of the following MATERIALS to June 30, 1902—viz.,

1. Bolts and Nuts.
2. Brushes.
3. Brass and Meter Fittings.
5. Castings.
6. Drysaltery.
7. Retort and Fire Goods.
8. Glass; Red and White Lead.
9. Iron and Steel.
10. Ironmongery.
11. Lead Pipe, Tin.
12. Mill Furnishing.
13. Oils and Tallow.
14. Purifier Grids.
15. Ropes and Flax.
16. Shovels, Pick Heads.
17. Timber, English and Foreign.
18. Tubing.
19. Wet and Dry Meters.
20. Stationery.
21. Lime.

Forms of Tender and all further Information may be obtained on application to the Engineer, Mr. S. Meunier, Stockport.
No Form of Tender other than that issued by the Committee will be accepted.
Tenders, endorsed "Contract 1, 2, &c.," as the case may be, addressed to the Chairman of the Gas and Electricity Committee, Portwood, Stockport, to be sent in on or before the 27th of June, 1901.
No Tender will be accepted without satisfactory proof that the firm tendering pays the standard rate of wages, and observes the standard number of hours.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
ROBERT HYDE,
Town Clerk.
June 13, 1901.

CITY OF NOTTINGHAM.
(WATER DEPARTMENT.)

TENDERS for the supply of Valves and HYDRANTS, PIPES, LEAD, COAL, TAPS, and FITTINGS.
The Water Committee of the Corporation are prepared to receive TENDERS from competent Iron-founders, Brassfounders, Valve Manufacturers, Lead Merchants, and Colliery Proprietors and Coal Merchants, for the supply of the under-mentioned Goods for the ensuing Year.

1. CAST-IRON DOUBLE-FACED SLUICE VALVES and HYDRANTS.
2. CAST-IRON MAIN PIPES.
   CAST-IRON SPECIAL PIPES.
3. LEAD PIPING.
   LEAD INGOTS.
4. GUN METAL TAPS & FERRULE FITTINGS.
5. STEAM COAL and OTHER FUEL.

Specifications and Drawings, together with Samples, Weights, &c., may be seen and other Information obtained at the Office of the Water Manager, Mr. Stephen Moore, St. Peter's Church Side; and Forms of Tender may be obtained at that Office on payment of One Guinea, which sum will be returned on receipt of a *bonâ-fide* Tender.
Tenders, endorsed "Tender for Valves," "Tender for Pipes," "Tender for Lead," "Tender for Taps," or "Tender for Coal," to be delivered to me at the Guildhall, Nottingham, on or before the 28th day of June inst.
The Committee do not bind themselves to accept the lowest or any Tender.
By Order of the Water Committee,
SAMUEL G. JOHNSON,
Town Clerk.
Guildhall, Nottingham,
June 12, 1901.

THE Directors of the Knutsford Light and Water Company invite TENDERS for the supply of 1800 Tons of the best GAS COAL (Screened) and 400 Tons of best GAS CANNEL, and 50 Tons of best hand-picked LIME, to be delivered during the Year ending May 31, 1902, at Knutsford Station.

Tenders to be sent in to the Chairman of the Company, Knutsford, not later than the 20th inst.

The Company do not bind themselves to accept the lowest or any Tender.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR COAL AND CANNEL.

THE Directors of the Radcliffe and Pilkington Gas Company invite TENDERS for about 12,000 Tons of GAS COAL and CANNEL.

Particulars may be obtained from the undersigned, to whom Tenders, properly endorsed, must be delivered on or before Wednesday, the 26th inst.

JAMES BRADDOCK,
Manager and Secretary.

Gas Offices, Radcliffe,
June 7, 1901.

THE Atherton Urban District Council are open to receive TENDERS for the supply of a GAS EXHAUSTER (capacity 50,000 cubic feet per hour) and sundry CONNECTIONS, delivered and fixed at the Gas-Works, Atherton.

Particulars can be obtained from Messrs. Thomas Newbigging and Son, Engineers, 5, Norfolk Street, Manchester.

Sealed Tenders, endorsed "Exhauster, Contract No. 3," to be delivered to me not later than Monday, June 24, inst.

D. SCHOFIELD,
Clerk.

Town Hall, Atherton,
June 15, 1901.

TO COAL CONTRACTORS AND OTHERS.

THE Sedgley Urban District Council invite TENDERS for supplying 750 to 1000 Tons of GAS COAL; the deliveries to be made at the Shut End Siding, at such times, and in such quantities, as may be directed.

It is desirable that an Analysis of the Coal proposed to be supplied be sent with the Tender.

Sealed Tenders, marked "Coal," must reach me on or before the 2nd of July, 1901.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
JOSEPH SMITH,
Clerk to the Council.

Offices: High Holborn,
Sedgley, June 11, 1901.

COUNTY BOROUGH OF BOLTON.

(GAS DEPARTMENT.)

TENDERS FOR COAL AND CANNEL.

THE Gas and Lighting Committee invite TENDERS for the supply of Screened GAS COAL, COBBLES, and CANNEL required during the Year ending the 30th of June, 1902.

Specification and Form of Tender may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Committee, to be delivered at the Gas Offices, Bolton, not later than Thursday, the 27th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. G. HINNELL,
Town Clerk.

Town Hall, Bolton,
June 10, 1901.

RUSHDEN AND HIGHAM FERRERS DISTRICT GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 8000 Tons of best GAS COAL (screened, unscreened, or large nuts), to be delivered between the 1st of August, 1901, and the 31st of July, 1902, on the Company's Sidings, Midland Railway, Rushden.

Sealed Tenders, endorsed "Tender for Coal," to be sent to the Secretary, Mr. G. S. Mason, on or before the 29th inst.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve the right to accept the whole or any portion of the quantity offered.

Further Particulars may be obtained from the undersigned.

THOMAS WATSON,
Engineer and Manager.

Gas-Works, Rushden,
June 10, 1901.

TYLDESLEY-WITH-SHAKERLEY URBAN DISTRICT COUNCIL.

THIS Council invite Tenders for the supply at the Gas-Works, Tyldesley, of the undermentioned Articles:—

3000 Tons COAL.
300 Tons CANNEL.
CAST-IRON PIPES.
LEAD PIPING.
WROUGHT BUCKSTAVES and GIRDERS.
LIME.

Further Particulars as to same may be obtained on application to the Manager, Gas-Works, Tyldesley.

Sealed Tenders, on Authorized Forms only, which will be supplied by the Gas Manager on application, to be sent in to the undersigned, endorsed "Tender for ——," not later than Saturday, the 6th of July.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
WM. J. MATTHEWS,
Clerk to the Council.

Council Offices, Tyldesley,
June 13, 1901.

THE Directors of the Keswick Gas Company invite TENDERS for their surplus TAR and AMMONIACAL LIQUOR for Twelve Months from the 30th inst., at per ton delivered into Contractor's Tanks at Keswick Railway Station.

Sealed Tenders, endorsed "Tenders for Tar," or "Liquor," will be received by the undersigned on or before Wednesday, the 26th inst., but the Directors do not bind themselves to accept the highest or any Tender.

J. H. BRODIE,
Secretary.

Keswick, Cumberland,
June 12, 1901.

THE Directors of the Keswick Gas Company invite TENDERS for the supply of 1500 Tons of best screened GAS COAL or NUTS, to be delivered to Keswick Railway Station, at such times, between the 30th inst. and the 31st of March next, and in such quantities as the Manager of the Gas-Works shall direct.

Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than the 26th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

J. H. BRODIE,
Secretary.

Keswick, Cumberland,
June 12, 1901.

URBAN DISTRICT COUNCIL OF ELLESMERE.

CONTRACT FOR GAS COAL.

THE above Council are prepared to receive TENDERS for the supply of COAL for their Gas-Works during the Year ending the 24th of June, 1902. The Coal must be a good Gas Coal, screened, and delivered free at Ellesmere Rly. or Canal Wharf.

Sealed Tenders, endorsed "Tenders for Gas Coal," accompanied by Analysis, to be sent to me not later than Thursday, the 4th of July next.

R. E. LLOYD,
Clerk to the Council.

Ellesmere, June 13, 1901.

MELTON MOWBRAY GAS COMPANY.

THE Directors of the above Company invite TENDERS for the supply of 1000 to 3000 Tons of GAS COAL, NUTS, and CANNEL, to be delivered at the M.R. and G.N. Stations here as required, during the Year ending June 30, 1902.

Further Particulars may be obtained from the Manager, Mr. G. Duncan, and Tenders sent on or before the 27th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
GEO. ROSE.
Secretary.

Melton Mowbray,
June 13, 1901.

TENDERS FOR COAL AND CANNEL.

THE Directors of the Stretford Gas Company invite TENDERS for the supply of CANNEL, best screened GAS COAL, and COAL and CANNEL NUTS, to be delivered during the next Twelve Months commencing Aug. 1, 1901, in monthly quantities as may be required.

Sealed Tenders to be sent in to the Chairman of the Company not later than June 25, 1901, next, endorsed "Tender for Coal."

Form of Tender to be obtained from the Secretary, Gas-Works, Stretford.

The lowest or any Tender not necessarily accepted.

By order of the Board,
BENJAMIN HAYNES,
Secretary.

Stretford, June 12, 1901.

BOROUGH OF BURTON-UPON-TRENT.

TAR.

THE Gas and Electric Light Committee invite TENDERS for the purchase of the surplus TAR to be produced at their Works during Twelve Months from the end of July next.

Probable quantity of Coal carbonized during the Twelve Months, 40,000 Tons.

The Tar will be delivered free into Contractor's Tank-Trucks, on the Gas-Works Railway Siding.

Payments: Net Cash Monthly.

Tenders, sealed and endorsed "Tender for TAR," are to be delivered to me, at or before Ten a.m., on Thursday, the 27th of June inst.

The highest or any Tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.

Gas and Electric Light Works,
Burton-upon-Trent, June 1, 1901.

CITY OF MANCHESTER.

(GAS DEPARTMENT.)

TENDERS FOR METERS.

THE Gas Committee are prepared to receive TENDERS for the supply and repair of ORDINARY and PREPAYMENT GAS-METERS during the ensuing One, Two, or Three Years, commencing on the 1st of July, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tenders for Gas-Meters," must be delivered at the offices of the Gas Department, Town Hall, on or before Saturday, the 29th inst.

Forms of Tender and further Particulars may be obtained on application to Mr. C. Nickson, Superintendent of the Department.

By order of the Gas Committee.
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
June 14, 1901.

HARROGATE GAS COMPANY.

THE Directors of the Harrogate Gas Company invite TENDERS for 20,000 Tons of GAS COAL.

Forms of Tender and other Particulars to be obtained of Mr. G. S. Sayner, the Works Engineer; and sealed Tenders to be delivered to the undersigned by Monday, the 8th of July next.

H. WILKINSON,
Secretary.

Gas Offices, James Street,
Harrogate, June 14, 1901.

TO COAL MERCHANTS, SHIPOWNERS, AND OTHERS.

THE Directors of the Torquay Gas Company are prepared to receive TENDERS for the supply of about 14,000 Tons (or such other quantity as may be agreed on) of best approved GAS COALS.

Tenders to state the price of the Coals, and the freight to Dartmouth or Torquay, separately and together; and also for delivery into the Company's Works, adjoining the Great Western Railway, free of all charges.

Further Particulars and Forms of Tender may be obtained from Mr. Beynon, the Manager of the Company, Hollacombe, Paignton; and Tenders are to be sent to the undersigned before the 2nd day of July next.

JOHN KITSON,
Secretary.

Torquay, June 10, 1901.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company are prepared to receive TENDERS for the surplus COAL GAS TAR and CARBURETTED WATER-GAS TAR, separately or mixed, produced by the above Company, for the Year ending the 30th of June, 1902. Coal carbonized, about 12,000 Tons per annum.

All Tenders to state the price per cask of 40 gallons.

Cartage to and from Railway Station, Guildford, free. All empties to be provided by Contractor.

Tenders, endorsed "Tar," to be sent to David Williamson, Esq., J.P., C.C., Chairman of the Gas Company, Guildford, on or before July 4, 1901.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
June 14, 1901.

SWINDON GAS AND COKE COMPANY, LIMITED.

TENDERS FOR GAS COAL.

THE Directors of the above Company are open to receive TENDERS for from 500 to 3000 Tons of best Screened GAS COAL, delivered free to the Great Western Railway Station or the Midland and South-Western Junction Railway Station, Swindon, in such quantities and at such times as may be directed during the ensuing Twelve Months.

Tenders must state for which Station the price is quoted, and be delivered not later than Saturday, the 29th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
H. C. SHEPHERD,
Secretary.

Gas-Works, Cricklade Road,
Swindon, June 12, 1901.

EXMOUTH GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Exmouth Gas Company invite TENDERS for 3000 Tons of clean unscreened (through and through) first-class DURHAM or ANY OTHER GOOD GAS COAL, to be shipped in such quantities (by Sailing Vessels only), and at such times as may be required, commencing from the 1st of August next.

Tenders to be accompanied by practical Working Analysis, and Prices may be quoted c.i.f. or f.o.b. at Exmouth Docks.

Sealed Tenders to be sent to the undersigned, addressed to the Chairman of the Company, and endorsed "Tender for Coal," not later than Saturday, the 29th day of June.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender (no Special Form of Tender issued).

By order,
JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
June 4, 1901.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to re- ceive TENDERS for the supply of not exceeding 6000 Tons of COAL for use at the Gas-Works, Beverley, for a period of Twelve Months from the 1st of October next, to be delivered as from time to time directed, and at the expense of the Contractors, f.o.b. at Keadby, or at the Pits, or at the Railway Station, Beverley, according to terms of Contract. The Coal to be of the best kind, well screened, free from Sulphur, Bats, Bind, Refuse, and Dirt, and to be weighed 21 cwt. to the ton upon the Corporation machine.

Payments will be made from time to time so long as the Contractor shall duly fulfil the Contract.

The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Contract as they think fit.

Further Information may be obtained of the Gas Manager, Mr. James Gibson, at the Gas-Works, Beverley; and Tenders, endorsed "Tender for Coals," must be delivered at my Office not later than Wednesday, the 26th day of June, 1901.

J. WILLIS MILLS,
Town Clerk

Memorandum.

June 4 1901

Golborne Gas Co., Ltd.,

GOLBORNE,

Near Newton-le-willows.

To Mr. Richmond

132 Queen Victoria St

London

Dear Sir

It gives me great pleasure to say, that during the past thirteen weeks You have supplied to our Company 24 5.* "Model" Gas Cookers, Also a large number of Grillers and Gas Fires; All of which are giving our Customers every Satisfaction, I think this is something Marvellous for a place like Golborne, And I have no doubt, but that this fact, Coupled, with the very large increase in number of our consumers, And the extraordanary out put of Gas, which they have caused; rendered us very valuable Assistance in Promoting our "Bill" before the Committee of the House of Commons which will be read a third time in a few days, And passed. I am also pleased to say orders come in daily for more of your "Model" Gas Cookers.

Yours Truly

Fred Silcock

Chairman

N.B.

* This Gas Co had only 320 consumers, & has at date 260 Best Grade Cookers fixed. or 3 out of 4 Consumers supplied with a Cooker in 3 months. & this through Canvassers. Richmond Gas Stove & Meter Co. Ltd. L.W.T.R.

June 7 1901

Golborne Gas Co., Ltd.,

To Richmond & Co

Dear Sir

In reply to your request as to publishing my letter re Gas Stoves; If you think the letter will do you any service I will gladly give you liberty to do what you like with it.

Yours Truly

Fred Silcock

Chairman

LONDON: Printed by WALTER KING (at the Office of King, Sell, & Olding, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London—Tuesday, June 18, 1901.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

TENDERS FOR GAS COAL AND CANNEL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 3500 Tons of Screened or Unscreened GAS COAL, and 1000 Tons of CANNEL, to be delivered at Wilmslow Station between the 1st day of July, 1901, and the 30th day of June, 1902.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Form of Tender may be had from the undersigned, to whom Tenders must be delivered on or before the 29th day of June, 1901.

WM. SEVERS,
Engineer and Manager.

Gas-Works, Wilmslow,
Manchester, June 5, 1901.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-light Company, invite TENDERS for the supply of about 16,500 Tons of screened GAS COALS, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year, commencing July 1, 1901, and ending June 30, 1902.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars) which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 15th day of June, 1901.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Engineer, Secretary, and Manager.

Gas-Works, Shrewsbury,
May 7, 1901.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the above Corporation are prepared to receive TENDERS for the supply of the following Goods:

1. COAL and CANNEL.
2. CAST-IRON PIPES and SPECIALS.
3. WROUGHT-IRON TUBES and FITTINGS.
4. LEAD PIPE.
5. GAS-METERS.
6. VITRIOL.
7. LIME.

Forms of Tender and further Particulars may be obtained on application to Mr. J. Foster, Gas and Water Manager, Leigh.

Sealed and endorsed Tenders must be delivered to the undersigned on or before Twelve o'clock Noon on Saturday, the 22nd day of June next.

The Corporation do not bind themselves to accept the lowest or any Tenders, and reserve to themselves the right to divide any Tender.

By order,
PEREGRINE THOMAS,
Town Clerk.

Town Hall, Leigh, Lancs.,
June 3, 1901.

GLASGOW CORPORATION.

(GAS DEPARTMENT.)

NEW PROVAN GAS-WORKS.

THE Corporation of Glasgow invite TENDERS for providing and erecting Six Sets of PURIFIERS and the IRONWORK of the Purifier-Shed, required in connection with their new Provan Gas-Works.

The Plans and Drawings may be seen, and copies of the Specification and Form of Tender obtained, upon application to Mr. W. Foulis, the Engineer, at his Office, 45, John Street, Glasgow, upon payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Offers, endorsed "Gas Department—Tender for Purifiers," must be lodged with the Subscriber on or before Tuesday, the 25th curt.

All Offers must remain open for a period of Thirty Days from the date thereof, and the Corporation do not bind themselves to accept the lowest or any Offer.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
June 5, 1901.

COUNTY BOROUGH OF WIGAN.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for—

(a) POWER STOKING MACHINERY (Charging and Drawing), with Elevators, Conveyors, Hoppers, &c., complete.

(b) HOT COKE CONVEYORS, ELEVATORS, &c., complete.

Separate Tenders for each section of the work to be sent in.

Drawings and Specification, delineating a complete scheme for manipulating the Coal and Coke between the Railway Waggons and the Coke Storing Yard, to accompany the Tenders.

The Engineer will be pleased to afford intending Contractors every facility for obtaining any Information they may require, on application being made to him.

Tenders sealed, and endorsed "Stoking Machinery," and "Coke-Conveyors," respectively, to be delivered to Harold Jevons, Esq., Town Clerk.

The Drawings and Specification to be addressed to the Engineer, endorsed respectively, as above, on or before Monday, the 19th of August, 1901.

JOS. TIMMINS,
Engineer.

Wigan, June 7, 1901.

LLANGOLLEN GAS COMPANY, LIMITED.

TENDERS are invited for the supply of 1200 (Twelve Hundred) Tons of GAS COAL, to be delivered at the Works of the Llangollen Gas Company, Limited, at Llangollen, as required between the 1st of July, 1901, and July 1, 1902.

Tenders, with Particulars, to be sent to the undersigned on or before the 24th of June, 1901.

HARVEY BIRCH,
Secretary.

Llangollen Gas Company, Limited,
June 8, 1901.

TO COLLIERY PROPRIETORS.

THE Corporation of Haverfordwest invite TENDERS for the supply of about 1400 Tons of Double Screened GAS COAL of the very best quality, to be delivered at the Haverfordwest Railway Station, or at the Gas-Works Quay, Haverfordwest, by Water Communication, in quantities as required by the Gas Manager during the Year commencing on the 24th of July next.

Tenders by Friday, the 13th day of July, 1901.

Forms of Tender and further Particulars of

R. T. P. WILLIAMS,
Town Clerk.

Council Chamber, Haverfordwest,
June 7, 1901.

ILFORD GAS COMPANY.

THE Directors of the above Company invite TENDERS for the supply of 5,000 Tons of GAS COAL, delivered *f.o.r.* Ilford Station, G.E.R., or in barge, *f.a.s.* the Company's Wharf, on the River Roding.

Sealed Tenders, endorsed "Tenders for Gas Coal," addressed to the Chairman, to be sent to the undersigned not later than Monday, June 17, from whom any further Information and Forms of Tender can be obtained.

J. H. BROWN,
Engineer and Manager.

Gas-Works, Ilford,
June 6, 1901.

BOROUGH OF SMETHWICK.

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the supply of about 30,000 Tons of screened and unscreened GAS COAL, and screened and washed NUTS (Coal and Cannel) for delivery during the Year ending June 30, 1902.

Form of Tender and further Information may be obtained of the undersigned.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Town Hall, Smethwick, to be sent in not later than the 27th of June inst.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
(Signed) W. J. STURGES,
Secretary.

Gas Offices, Town Hall,
Smethwick, June 8, 1901.

ORIENTAL GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that an EXTRAORDINARY GENERAL MEETING of the Oriental Gas Company, Limited, will be held at the Offices of the Company, Finsbury House, Blomfield Street, in the City of London, on Wednesday, the 26th day of June, 1901, at Eleven o'clock in the forenoon precisely, for the purposes of considering, and, if thought fit, approving, the draft new Regulations which will be submitted to the Meeting, and in the event of the approval thereof, with or without modification, to pass a Resolution to the following effect:—

That the new Regulations already approved by this Meeting, and for the purpose of indentification subscribed by the Chairman thereof, be, and the same are hereby, approved, and that such Regulations be, and they are hereby, adopted as the Regulations of the Company to the exclusion of all the existing Regulations thereof, whether expressed in the Deed of Settlement dated the 25th day of April, 1853, or in Resolutions which have from time to time been passed since the formation of the Company, or otherwise.

Should the Resolution be passed by the required majority, it will be submitted for Confirmation as a Special Resolution to a Second Extraordinary Meeting which will be subsequently convened.

NOTE.—A copy of the proposed new Regulations may be seen at the Offices of the Company between the hours of Twelve and Two o'clock on any working day prior to the 26th of June.

By order of the Board,
H. J. LUFF,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., June 17, 1901.

SALE OF ISSUE OF
ORDINARY NEW AND DEBENTURE STOCKS
IN THE
FAVERSHAM GAS COMPANY.

MR. C. STIDOLPH has been instructed by the Directors of the Company to SELL BY AUCTION, at the Ship Hotel, Faversham, on Wednesday, June 26, 1901, at 2.30 o'clock in the Afternoon,

£19,840
WORTH OF
ORDINARY NEW STOCK and 4 PER CENT. DEBENTURE STOCK
IN THE
FAVERSHAM GAS COMPANY,

As under:—

50 lots of Ordinary New Stock of £100 each.
100 " " " " of £50 each.
230 " " " " of £10 each.
30 lots of 4 per cent. Debenture Stock of £100 each.
75 " " " " of £50 each.

Particulars and Conditions of Sale may be obtained of the AUCTIONEER, 9, East Street, FAVERSHAM; or of Messrs. TASSELL AND SON, Solicitors, 20, West Street, FAVERSHAM.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK only, WILL BE CLOSED on the 15th and RE-OPENED on the 29th inst.

WILLIAM E. ROBERTS,
Secretary.

63, Chancery Lane, W.C.,
June 11, 1901.

FELIXSTOWE GASLIGHT COMPANY, LIMITED.

ISSUE OF 698 5 PER CENT. CUMULATIVE PREFERENCE SHARES OF £5 EACH.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE.

Tenders must be delivered at the Company's Office, Hamilton Road, Felixstowe, not later than Twelve o'clock at noon on Monday, the 1st day of July, 1901.

Particulars and Conditions, together with Forms of Tender, may be obtained at the said Offices, or at the Office of the Company's Solicitors, Messrs. Jennings & Haward, Felixstowe, or of the Company's Bankers, Messrs. Bacon, Cobbold, & Co., Ipswich and Felixstowe, or will be forwarded on application.

By order of the Board of Directors,
F. PATERNOSTER,
Secretary.

Hamilton Road, Felixstowe,
June 15, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO BE SOLD by Auction, in the Board-Room of the Company's Offices, Pilgrim Street Newcastle-on-Tyne, on Tuesday, the 16th of July, 1901, at Half-past Twelve o'clock precisely, by Mr. Charles A. Joel, in such Lots as are provided for in the Company's Act of 1894—

FIFTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894).

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 68, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne,
June 11, 1901.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

IMPORTANT SALE OF A
FURTHER ISSUE OF NEW SHARES
IN THE ABOVE SUBSTANTIAL AND OLD-STANDING COMPANY.

C. B. SMITH, SAPP, & WYATT beg to announce that they are favoured with instructions from the Directors of the above-named Company to SELL BY PUBLIC AUCTION, at their Property Sale Rooms, 166, Queen Street, Portsea, on Thursday June 20, 1901, at seven o'clock in the evening, the seventh portion of the New Issue authorized under "The Borough of Portsmouth Water Order, 1898," comprising—

1500 SHARES OF £5 EACH

fully paid), forming part of the New Ordinary Capital authorized under such Order.

The Auctioneers beg to call the special attention of Capitalists, Investors, and others to this very favourable opportunity of securing Shares in such a thoroughly sound Local Company.

The Shares will be sold Free of any Charges, Fees, or Expenses whatever to the Purchaser.

Full Particulars and Conditions of Sale may be obtained, with any further information, from the Secretary to the Company, J. L. WILKINSON, Esq., F.I.S., at the Company's Offices, Commercial Road, PORTSMOUTH; or of the AUCTIONEERS, 166, Queen Street, PORTSEA, and FAREHAM.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 Inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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Gas Companies are solicited to try Samples of the
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BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, DEWSBURY.

PREPAYMENT ATTACHMENTS
AND
ALL PARTS FOR GAS & WATER METERS.
Quotations to Samples.
THE
Tourtel Manufacturing Co., Ltd.,
146A, QUEEN VICTORIA STREET, E.C.
Can undertake the Largest Contracts.

BOLDON GAS COALS.

Yield of Gas per Ton. .	10,500	Cubic Feet
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.
For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.
Telegraphic Address: "PARKINSON, NEWCASTLE."

HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.
Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm Candl.
Coke (of good & pure quality)	13$\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.
SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.
Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.
Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.
These Coals may be bought through the Principal Merchants in England, or direct from
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ANOTHER REMINDER!
TELEGRAMS: "EVESON, BIRMINGHAM."

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
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HYDRAULIC BLOWER
For blowing Air into Gas Purifiers for the purpose of
REVIVIFYING THE FOULED OXIDE.
Full Particulars on application.
LUXWERKE LUDWIGSHAFEN AM RHEIN.

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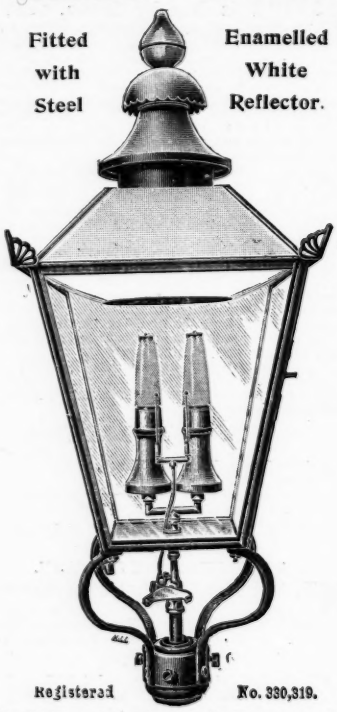
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.

Registered No. 330,319.
The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.
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Telephone: 1215 HOLBORN. Telegrams: "LUMINOSITY."

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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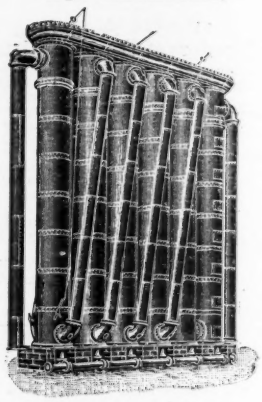
NEWBATTLE COLLIERIES,
DALKEITH N.B.

FOR SALE, EXCEPTIONAL BARGAIN IN SECOND-HAND
ANNULAR CONDENSERS
as per Illustration below.

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Complete with 16-inch Valves and Connections.
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Cheap, less than Half New Price accepted.
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Inspection Invited. Photo, &c., on application.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
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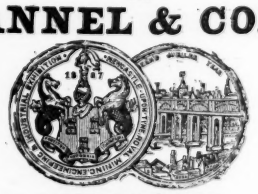
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BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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OF SUPERIOR QUALITY
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These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

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And at Pharos Works, Hackney Wick.
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Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.
Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.
Samples and Prices may be had on application.

THE INCANDESCENT TRUST,
LIMITED.

THE INCANDESCENT TRUST, LIMITED, of 6, Trinity Square, Tower Hill, London, E.C., have undertaken to carry through any action brought against its Policy-holders for the alleged infringement of the so-called 1893 patent of the Welsbach Incandescent Gas-Light Company, Limited. Test actions are proceeding, and several are in abeyance pending the same.

The Trust desires to point out that the injunctions advertised by the Welsbach Incandescent Gas-Light Company, Limited (are not binding upon any person other than those who have consented or who are privy thereto), and the fact that one or two persons have agreed to submit and have been restrained does not establish the validity of the so-called 1893 patent.

The Trust are advised that the alleged 1893 patent, upon which the Welsbach Incandescent Gas-Light Company, Limited, are proceeding, is invalid, and will not be upheld when properly contested in the Courts.

The Directors of the Trust have retained the services of Mr. Jonathan E. Harris, of 95, Leadenhall Street, London, E.C., a well-known Solicitor in Patent cases, to act on its behalf. Under this gentleman's advice, and with the co-operation of the Company's Directors and Council, assisted by the best of Patent experts and Counsel, any Writ, Summons, or Application for an injunction or other proceedings will be defended or otherwise attended to on behalf of the Company's Policy-holders.

Apply for Prospectus and all Particulars to:—
The Secretary, Incandescent Trust, Limited,
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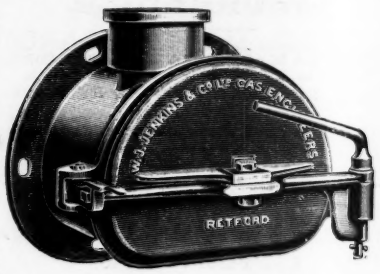
WITH SELF-SEALING LIDS FOR
HORIZONTAL AND INCLINED RETORTS.



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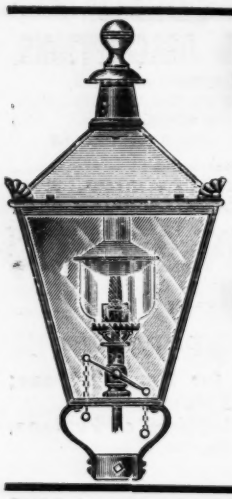
W. J. JENKINS & CO., LTD., RETFORD.



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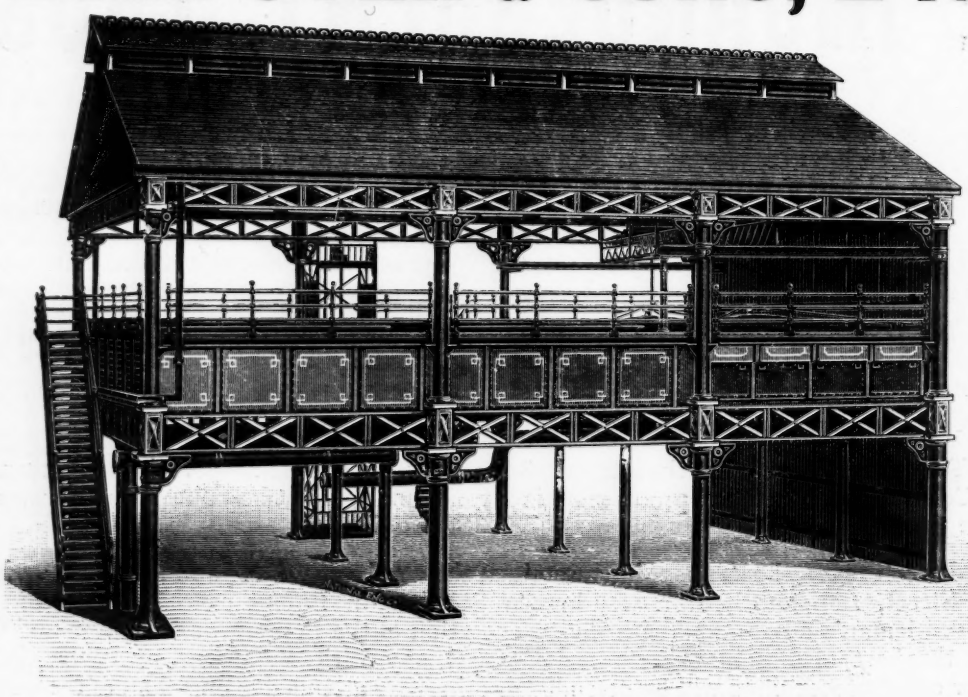
Suitable for Incandescent or Ordinary Burners.

DRY GAS-METERS, SERVICE-CLEANSERS, &c., &c.

PRICE LISTS ON APPLICATION.

R. DEMPSTER & SONS, LD. ELLAND, YORKS.

Telegrams: "DEMPSTER, ELLAND."



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CONTRACTORS FOR EVERY DESCRIPTION OF GAS APPARATUS.

Carbonizing Plants a Speciality.

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Gas Lighting Engineers.
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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
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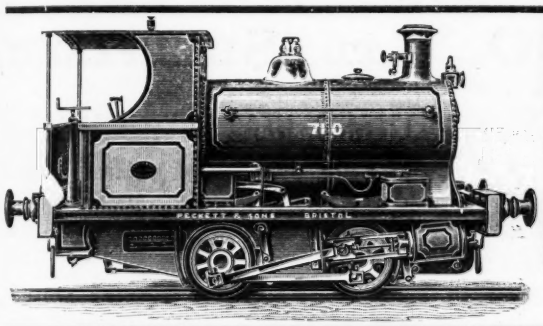

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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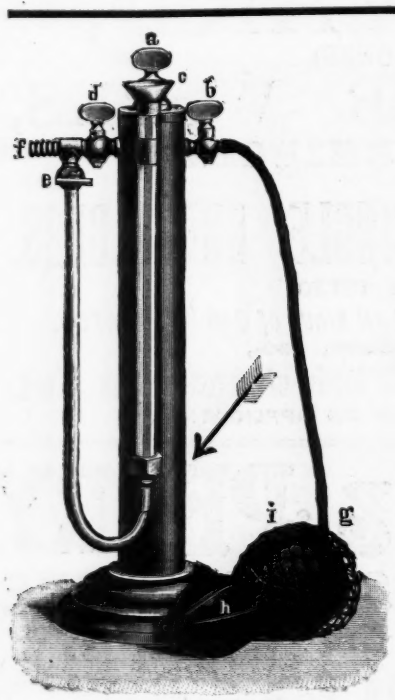

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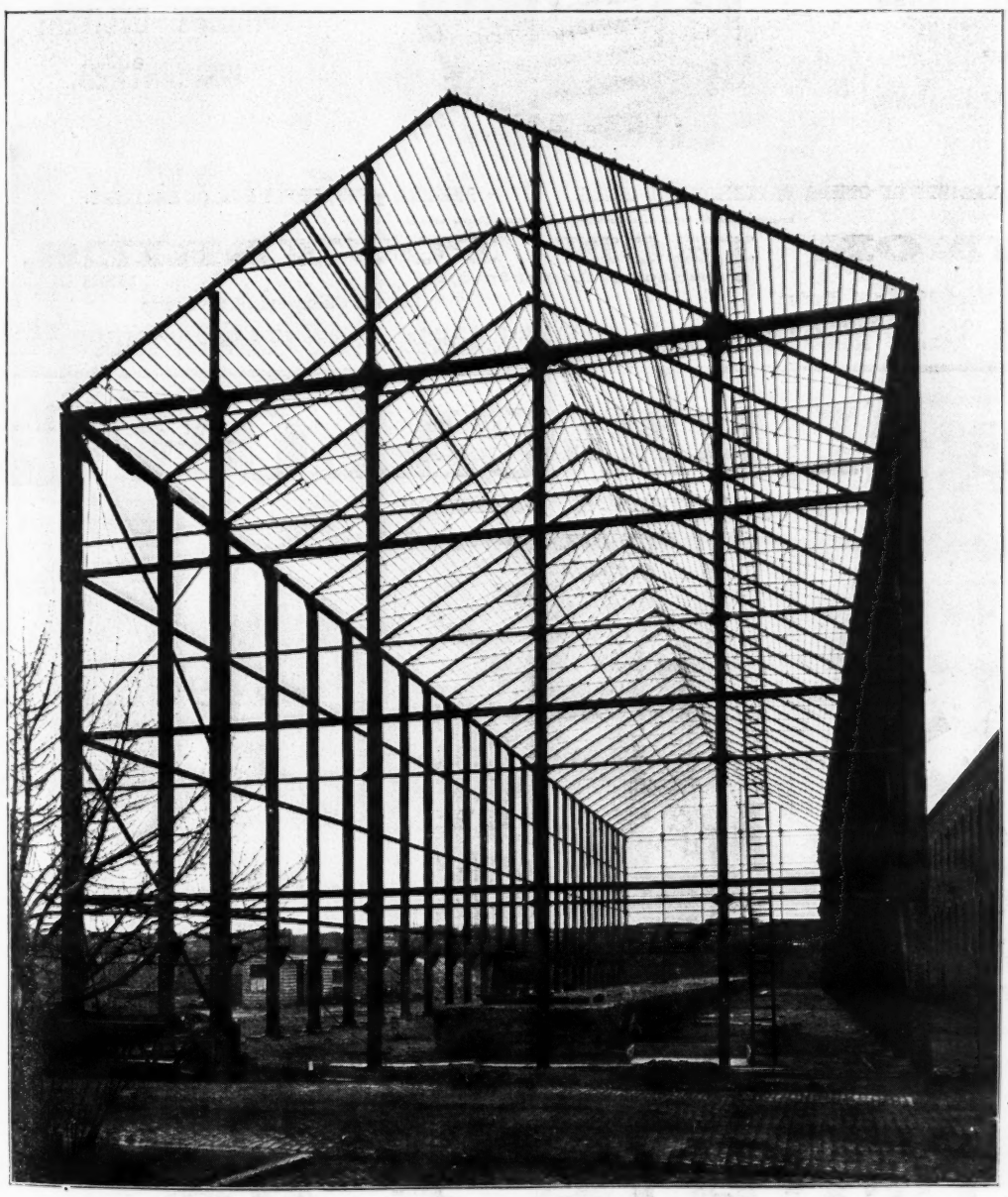

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STEEL RETORT-HOUSE RECENTLY ERECTED BY MESSRS. CUTLER.

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IN TWO SIZES.

OVENS:

12 x 12 x 19 inches

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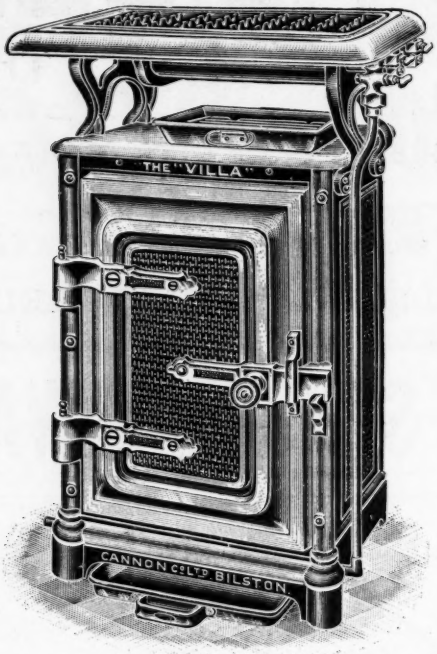

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PROMPT DELIVERY GUARANTEED.

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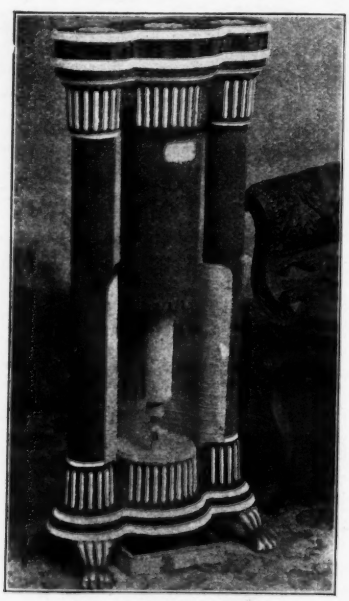

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This Stove is let on Hire by the leading Gas Companies.

Full Particulars and Prices from

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"Washer has been greatly overworked this winter, but has done extremely well. Our maximum through the Washer has been 1,400,000 cubic feet per day."

N.B.—This Machine was constructed to pass 1,000,000 cub. ft. per day.

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PERFECTLY RELIABLE SELF-LIGHTERS.

As applied to Welsbach Burner.

Flat-Flame Burner Pattern.

No Matches! No Tapers!

No Bye-Pass!

No Gas Burning
When the Burner is turned off!

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Ignition Agents for Renewals.

ENORMOUS SUCCESS!

Result of the labour of the first Chemists in Europe at great Cost!!

The Self-Lighter is supplied for all kinds of Gas-Burners.

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LIGHT

THE TRANSPORTABLE SELF-LIGHTING
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No Matches required. Lights every Gas Fixture.
A SPLENDID SELLING LINE.

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Any form of transportable Self-Lighter other than those supplied through us are INFRINGEMENTS, and dealers in or users of the same render themselves liable under the Patents Act.

SAMPLE, POST FREE, 3/-

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WROUGHT-IRON AND COPPER FITTINGS
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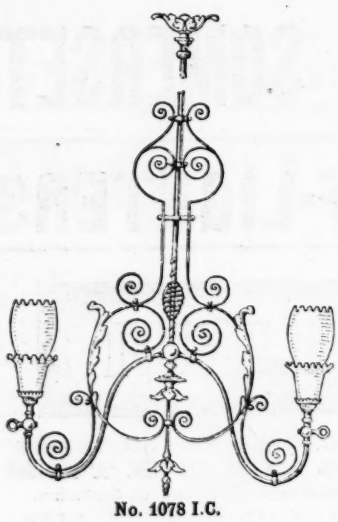
is now being issued to the Trade.

We give below a few Examples.



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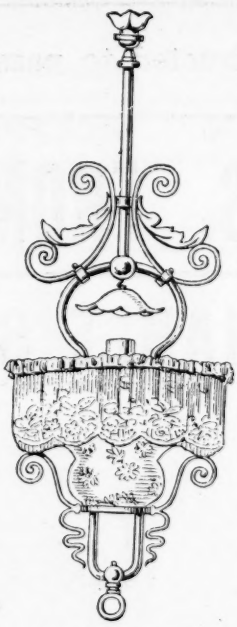
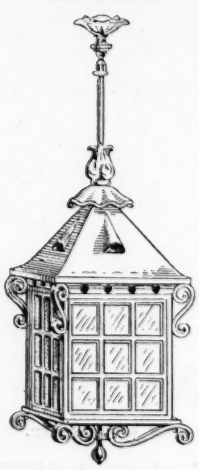


No. 1107 I.C.

No. 1045 I.C.

No. 1055 I.C.



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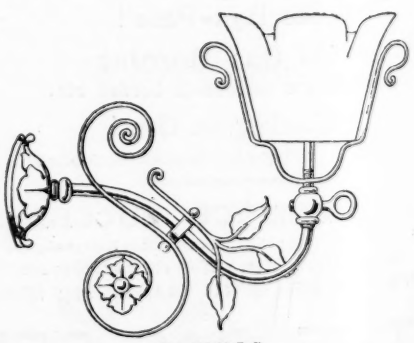
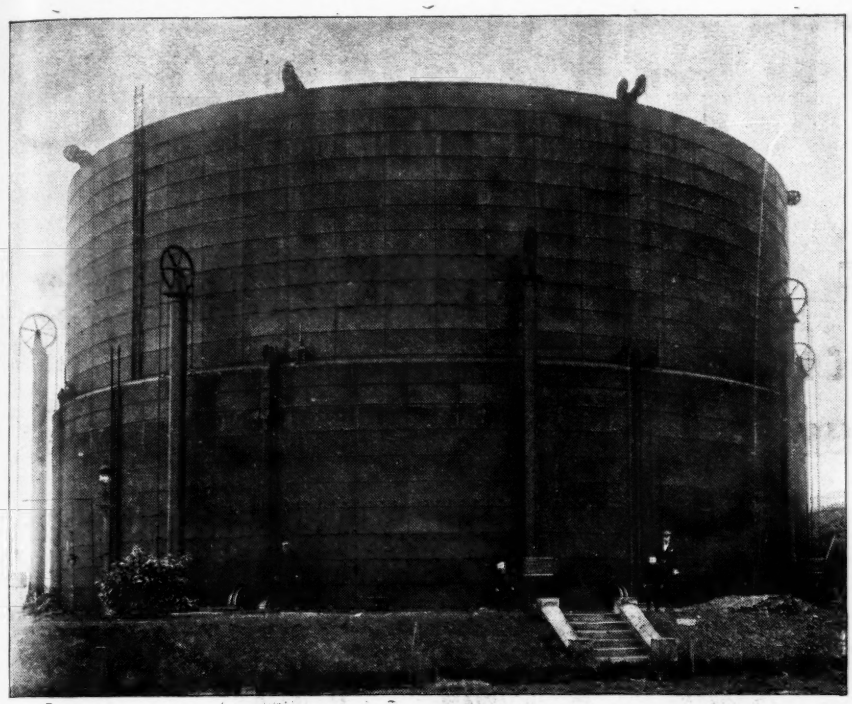


No. 1060 I.C.

EAST-END BRANCH: 143, HIGH STREET, SHOREDITCH.



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80 ft. diameter by 24 ft. deep. Both Lifts Cable-Guided. Counterbalance to Outer Lift on old Columns.

KIRKCALDY GASLIGHT COMPANY.

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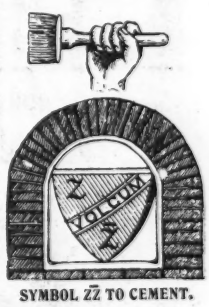

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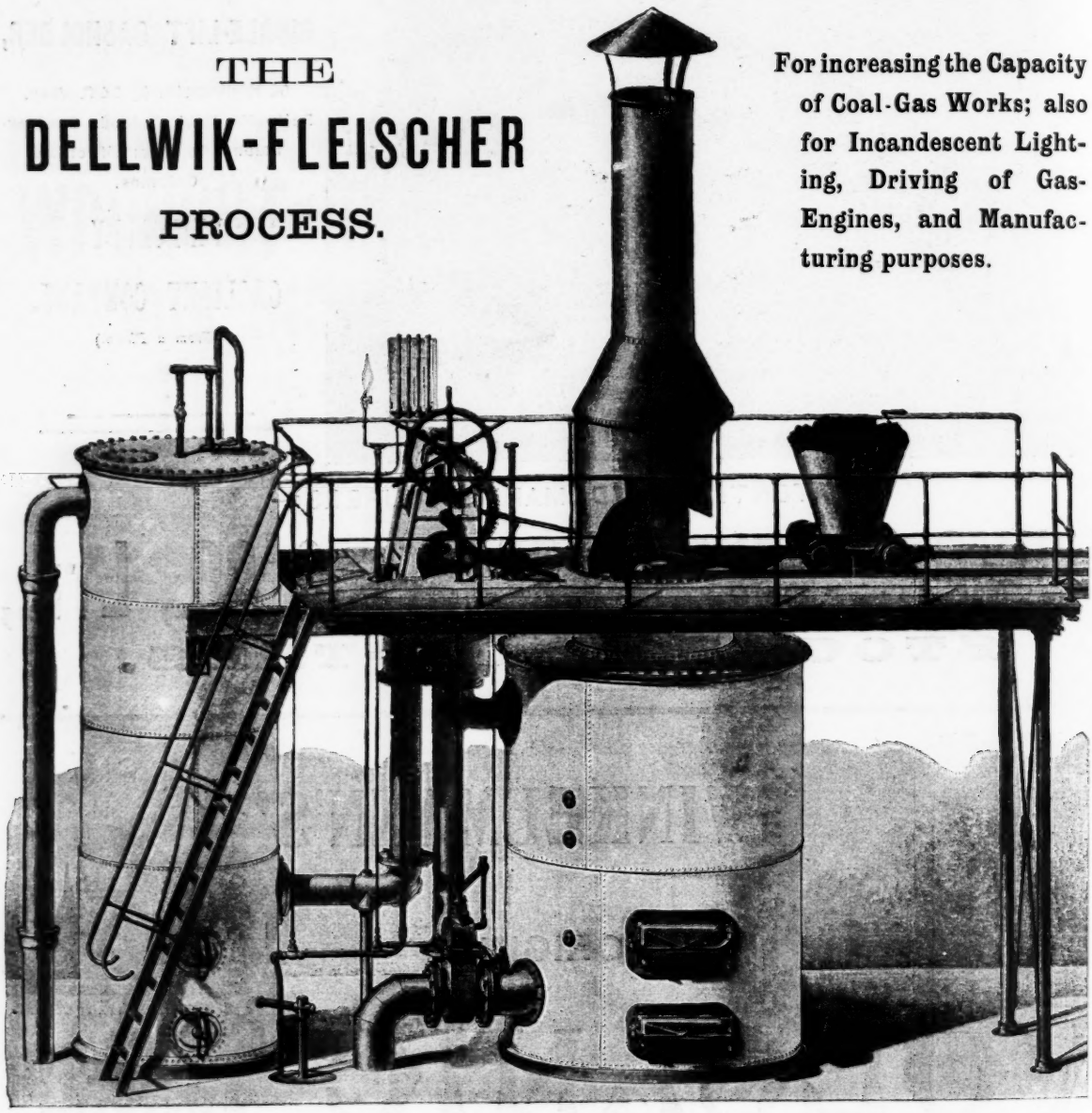

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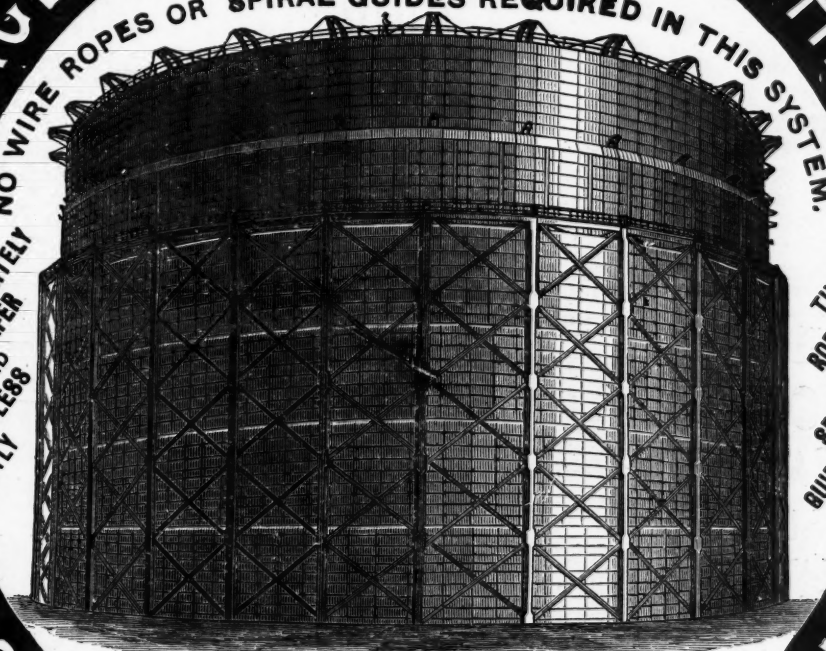

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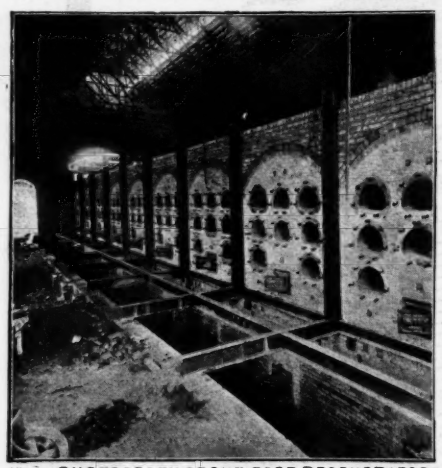
OF EVERY DESCRIPTION



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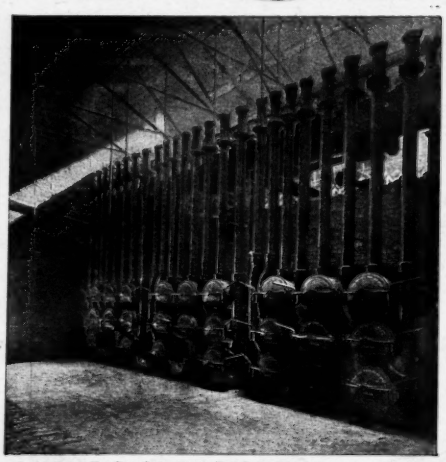

PHOTOGRAPH OF OUR DEEP REGENERATORS AFTER COMPLETION.

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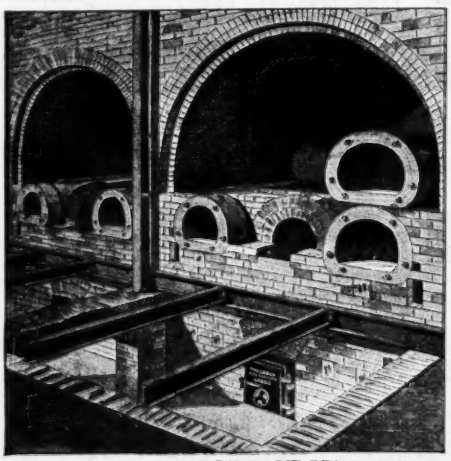
RETORT IRONWORK

COAL & COKE BREAKING AND CONVEYING APPARATUS.

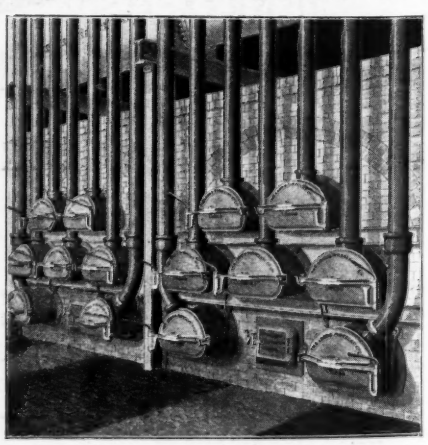
BUILDING ROOFS &c.



PHOTOGRAPH OF OUR SHALLOW REGENERATORS DURING CONSTRUCTION.

Telegrams "Settings" Leeds

Telephone No. 1332



PHOTOGRAPH OF OUR SHALLOW REGENERATORS AFTER COMPLETION.

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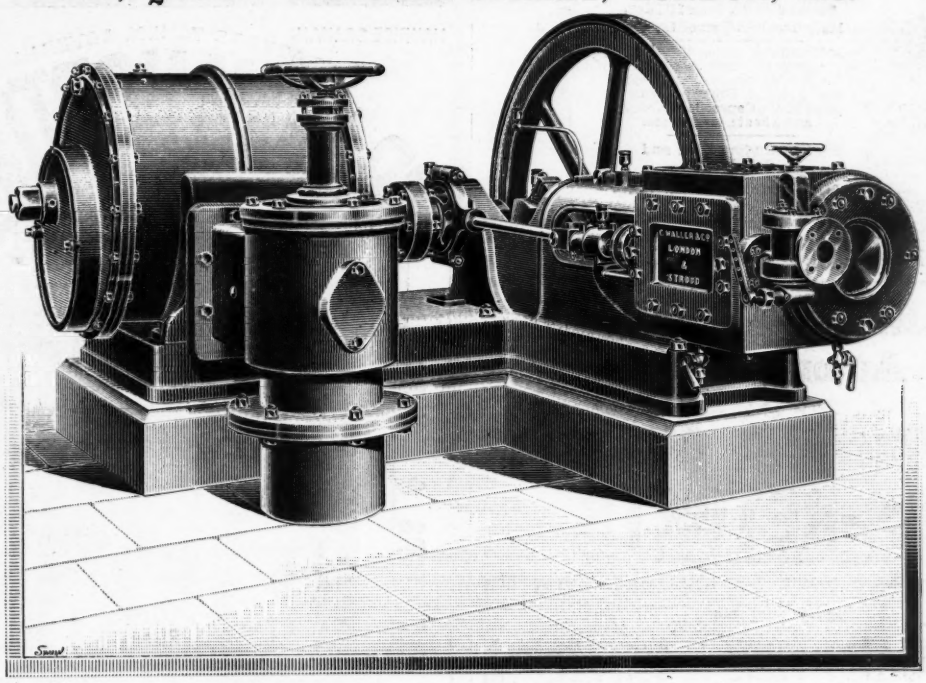

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Use LESS STEAM and give a STEADIER GAUGE than any other type.

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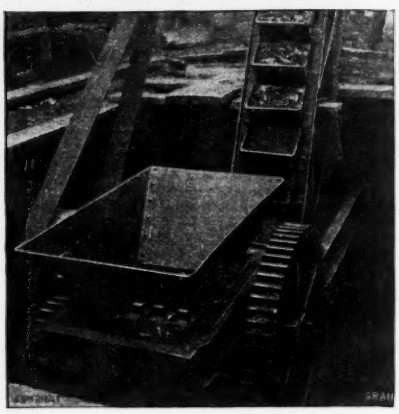

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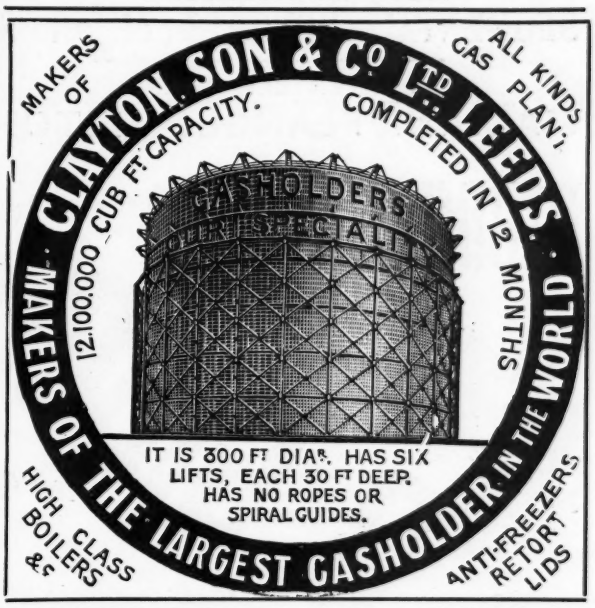
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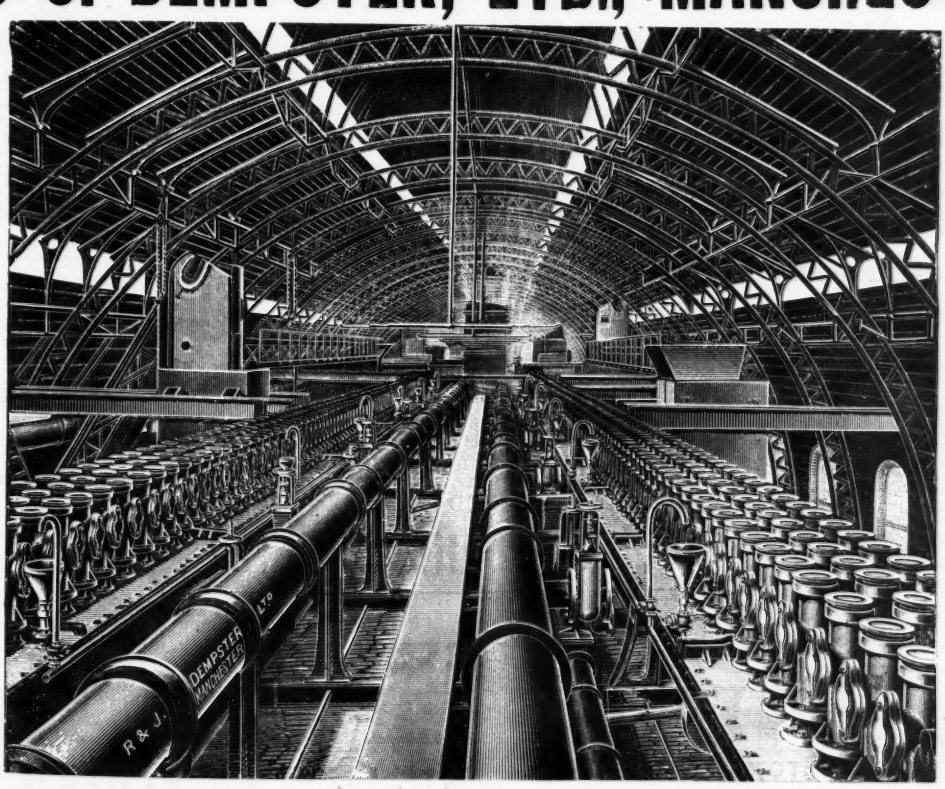

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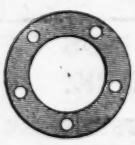

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